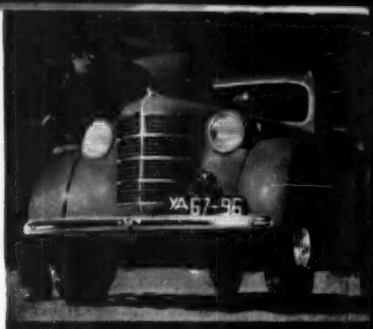
POPULAR SCIENCE

MONTHLY

MECHANICS AND HANDICRAFT



All About *Russian Cars*

PAGE 106

25¢

October

How to Winterize Your Home

PAGE 177

Before you put in anti-freeze . . .

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with

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Mechanics and Handicraft

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This Month's Big Features:

Scientist Previews First Atomic Plane..... 98

All About Russian Cars.....106

Steel Plant to Be World's Most Modern.....113

Wilbur Shaw Reports on GM's New Engine..125

He Turned a Hobby into a Big Business.....131

Model Railroad Runs on Real Steam.....140

These Cars Are Tailored to Order.....146

How They Make Shotgun Shells.....170

Winterizing Your Home.....177

Undercoating Your Own Car.....193

Gus and the Missing Straddle Truck.....196

How to Judge Used Power Tools.....201

Experts Show You How to Move.....208

How to Photograph Your Boss.....214

Shovel Snow with a Lawn-Mower Engine....225

Heat That Travels Like Light.....230

(More features and departments are listed on page 4.)

Gerald Wendt, former dean of Pennsylvania State College's chemistry and physics school, describes the coming atomic airplanes on page 98. After serving as science director of the New York World's Fair, he became editorial director of Science Illustrated, *and is now a noted lecturer on science.*

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Picture Features

Doughnut Proposed as Space Station.....120
5 Don'ts for Drivers.....134
They Built a Blimp for Fun.....154
GI Truck Gets Automatic Drive.....158

Mechanics & Handicraft

Father and Son Build Hot Rod.....118
Stethoscope Spots Car Noises.....187
What's Inside a TV Doghouse.....218
How to Sharpen Circular Saws.....235

Departments

Letters 14
New Ideas from the Inventors.....129
Aids to Modern Living.....138
Know Your Weapons.....145
Keeping the Home Shipshape.....151
I'd Like to See Them Make.....160
P.S. Last Minute News and Notes.....176
Hints from the Model Garage.....199
New Tools 223
New Shop Ideas.....228

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Families that read POPULAR SCIENCE MONTHLY own 970,000 automobiles—280,000 more than are owned by all of the families in New York City. These figures inspired Robert R. MacGuire, a New York artist and craftsman, to build this make-believe city. It took several thousand copies of POPULAR SCIENCE to do it —a fraction of the more than a million copies distributed every month.

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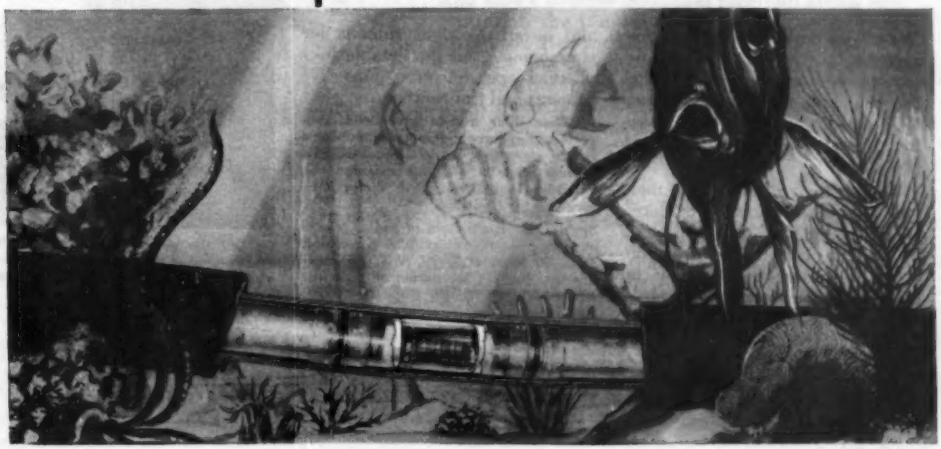
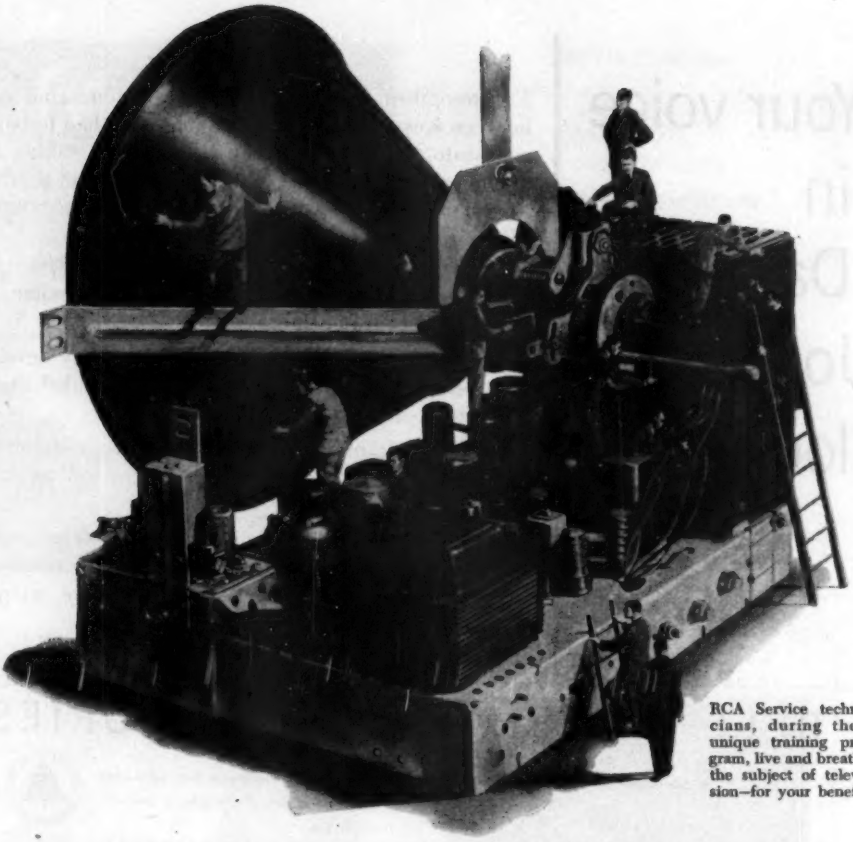
Cutaway view of deep-sea amplifier. Tubes and other elements are housed in plastic cases then enclosed in interleaved steel rings in a copper tube. Glass tape, armor wire and impregnated fiber complete the sheath.





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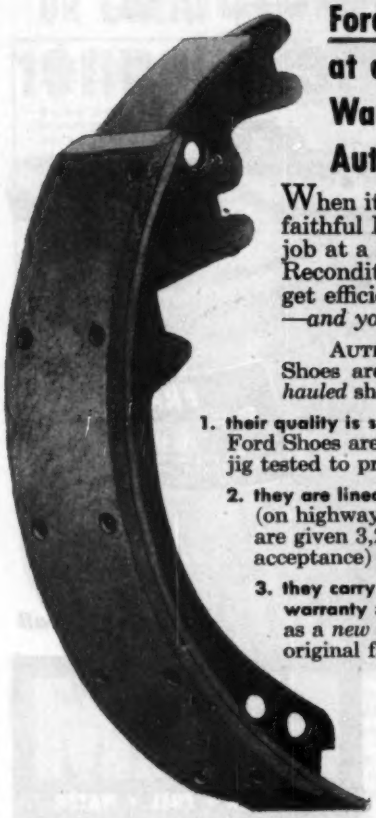

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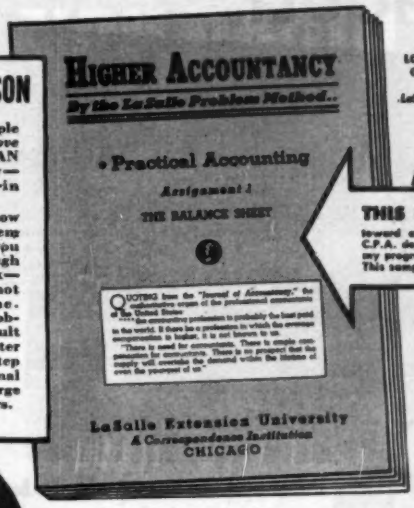

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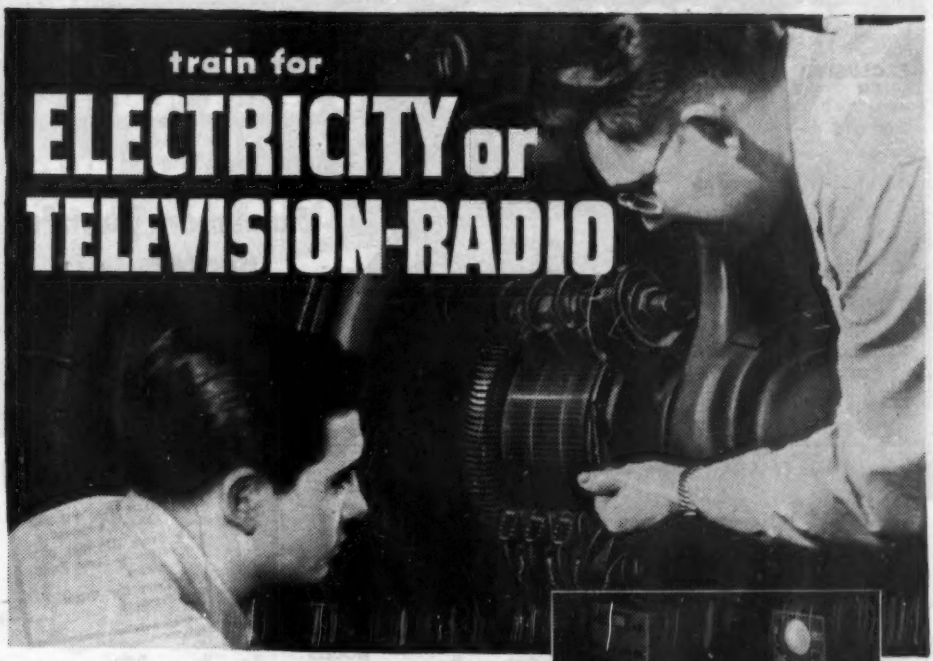

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Nothing at all to buy. Complete sales kit including actual samples of materials used ▸ trim, Leopard cloth, plastic, leatherette, etc. Beautiful illustrations. Big supply of C.O.D. order taking forms. Everything you need to start cashing in immediately. Get in on this lucrative business. Write for selling kit, including Bonus Offer of FREE Seat Covers for your own car.

JUST SEND COUPON

ALL FREE!

RUSH NAME FOR FREE SAMPLE

Give Make, Year and Model of Your Car

Anyone working full or spare time can realize big money. No need to search for prospects. Every car owner is one. Make year around STEADY PROFITS. Get free selling kit at once. ACTUAL SEAT COVERS GIVEN FREE TO PRODUCERS FOR OWN USE! Write for full details —or mail coupon below—TODAY!

KEY PRODUCTS CORP.
800 No. Clark St., Dept. 6-S, Chicago 10, Ill.

KEY PRODUCTS CORP., DEPT. 6-S
800 N. CLARK STREET, CHICAGO 10, ILLINOIS

Rush me Free Sample Outfit at once so that I can start making real money with Key Products. (If you own a car include the following information):

MAKE OF CAR..... YEAR.....

MODEL..... ☐ 2-Door ☐ 4-Door

NAME .....

ADDRESS .....

CITY..... STATE.....

VOTE TODAY

FOR THE FUTURE YOU WANT!

AMERICAN SCHOOL, Dept. G746, Drexel at 58th, Chicago 37, Ill.
Without obligation, please send FREE and postpaid, full particulars about the subject checked below.

- ☐ Accounting
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- ☐ Automotive Technician
- ☐ Better Foremanship
- ☐ Bookkeeping
- ☐ Business Management
- ☐ Contracting
- ☐ Diesel Technician
- ☐ Drafting—Building Trades
- ☐ Drafting—Machine Trades
- ☐ Electrical Engineering
- ☐ Electricity—Practical
- ☐ Electronics—Industrial
- ☐ High School Courses
- ☐ Machine Shop Operations
- ☐ Mathematics & Slide Rule
- ☐ Mechanical Engineering
- ☐ Plastics Engineering
- ☐ Plumbing—Practical
- ☐ Private Secretary
- ☐ Refrigeration
- ☐ Retail Merchandising
- ☐ Salesmanship—Outside
- ☐ Sheet Metal Work
- ☐ Tool Making

NAME.....
HOME ADDRESS.....
CITY.....STATE.....
OCCUPATION.....AGE.....

THIS IS YOUR BALLOT

Check the career that interests you most, Fill in spaces and mail at once—no obligation

● *Today,* choose the job you want — and prepare for it in spare time at home. Or if you are already engaged in the work you like best, start training *now* for quicker promotion. In hours you might otherwise waste, gain the knowledge and skill that can help you to get ahead faster, make more money, and have greater security.

Thousands before you have followed this plan and were able to step out ahead of others who didn't fit themselves for advancement or who seemed willing to trust to luck.

Training Backed by 54 Years of Experience

For over half a century American School has helped ambitious men and women toward success by providing specialized training for commercial and technical advancement. At a cost you can afford *you* can prepare *at home* to climb in the kind of work you prefer. American School's study program for *you* has been planned by experts with years of experience in the subject you select and they will give you needed guidance every step of the way.

Don't Delay Your Start

Give serious thought to the list of training courses listed above. Pick the opportunity that interests you, check it and add your name and address. (Check more than one if you are undecided as to which appeals most.) Finally clip out and mail the "ballot" and full information will be supplied, without cost or obligation.

PRACTICAL, EFFECTIVE HOME STUDY TRAINING SINCE 1897

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THE SOONER YOU START, THE SOONER YOUR GOAL CAN BE REACHED

Build A FIREPLACE

around this scientifically designed steel form which also provides circulating heat that assures perfect fireplace operation.

free folder tells how

TELLS HOW TO BUILD YOUR FIREPLACE—*Step by Step*

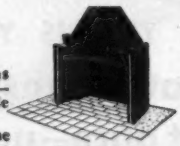
- Foundation
- Steel heat-circulating form
- Cold and warm air ducts
- Chimney and flue construction
- Mantel or decorative front

Foundation

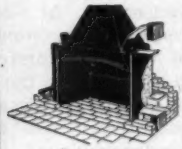
ASK FOR BOOK "100 FIREPLACE IDEAS"

Beautiful fireplace designs modern and conventional—shows artistic use of available material.

Enjoy circulating heat and the radiance of an open fire in your *Home, Playroom, Cottage* or *Camp.*



Fireplace form set on foundation includes firebox, damper, down draft shelf and smoke dome.



Brick, stone or cement block can be used around the form.

- ☐ Send free directions for building heat-circulating fireplace.
- ☐ Send Book "100 Fireplace Ideas." Pocket size book, sent free.
- ☐ Send larger book, 8½ x 11, beautifully illustrated, 25c.
- ☐ Send outdoor fireplace folder with 10 beautiful designs Free.

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192 W. Austin Street, Buffalo 7, New York

Letters

Bike Hitches Car Ride

Why the "bicycle" wheel on the back end of the Cadillac shown in the picture on bottom of page 49 in July? Presume it is some testing device, but what for?

JOHN HOWARD, Seattle

See page 126.

PS Joins the Navy

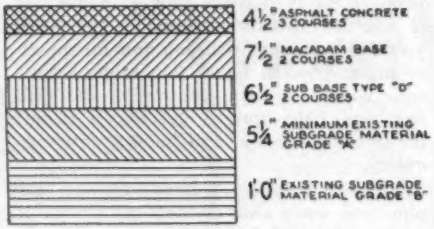
I have been a POPULAR SCIENCE reader for a number of years; in fact, I have retained all of the issues since 1943 excepting two. What impresses me the most is the variety of articles to be found. I feel that PS has helped to create and develop my interests a hundred-fold.

HOWARD J. WILSON, Department of Defense Office of Naval Research, Washington, D. C.

Getting Back on the Road

This is with reference to your article in the July issue regarding the New Jersey Turnpike.

The cross section of the highway as shown in the top right-hand corner of page 74 is a little different from the one we are using. For your information, topsoil is only used in the area that is to be seeded.



I am enclosing a Turnpike cross section [above] which shows a one-half section of the New Jersey Turnpike as built in Section 2.

JOHN A. MCFARLAND
Ass't Resident Engineer
Gannett Fleming Cordry and Carpenter, Inc.
Barrington, N. J.

Thanks to Mr. McFarland for giving us the latest data on the paving, which is now

INVENTORS

Learn how to protect your invention. The U. S. Patent Laws provide that any new and useful art, machine, article of manufacture, or composition of matter, or any new and useful improvement thereof, may be patented if the act of invention is involved. Therefore, every inventor with a valuable invention should take advantage of the Patent Laws and proceed for patent protection in order to safeguard his rights.

A patent gives the inventor the exclusive right to prevent others from making, using, or selling the invention claimed in the patent for a period of seventeen years.

The Patent Laws were enacted for the benefit of the inventor to give him protection for the features of his invention which are patentable. These features must be properly and concisely set forth and claimed in a formal application for patent, in order to comply with the requirements of the Patent Laws. For that reason, unless the inventor is familiar with patent matters, he should engage a competent registered patent attorney or agent to represent him. We are registered to practice before the U. S. Patent Office and are prepared to serve you in the handling of your patent matters.

A specially prepared booklet entitled "Patent Guide for the Inventor", containing detailed information with respect to patent protection and procedure, together with a "Record of Invention" form will be promptly forwarded to you without obligation upon request.

CLARENCE A. O'BRIEN & HARVEY JACOBSON

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Tame that wild grain with FIRZITE. Virtually prevents grain raise or checking... readies the surface satin-smooth for paint, stain or enamel. (For blond, pickled, or tinted effects on soft or hard woods, use White Firzite).

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NAME_____

ADDRESS_____

being put in place on the New Jersey Turnpike. When George Waltz and Bill Morris gathered the information and photographs for the July story, the paving operation had not yet begun. Also, the roadbed varies somewhat from section to section. Thus the discrepancies in the thicknesses of the various layers. The label "Top Soil," however, was a typographical error. It should have read "Top Base," according to information received at that time.

Asked for It—Got It

In your June issue on page 143, Mr. E. R. Whitney "Would Like to See Them Make" a rubber molding strip for car doors.

I am enclosing a photo [below] of our rubber molding installed on a Packard. This

item has been on the market for about two years, sells for $1.00 per set of two strips, and can be applied to practically 95 percent of the cars now in use.

RAY A. BRAINARD, West Hollywood Craft Shop, Hollywood, Calif.

Could Anyone Help?

I have just obtained a 1923 Jewett sedan and would like to locate a service manual or other information that would help me restore it to good condition.

WILLIAM PENNANAN, 531 N. Main St. Rochester, Mich.

Well Traveled Piston; Well Split Hair

Those Wilbur Shaw "Reports from the Driver's Seat" are swell. But I've noticed something funny in the fact boxes giving

INVENTORS

If you believe that you have an invention, you should find out how to protect it. The first step is to have a search made of the prior pertinent U. S. patents. If a report on this search indicates that the invention appears patentable you can apply for a patent, and the specifications and claims should be prepared.

The firm of McMorrow, Berman & Davidson, with offices in Washington, D. C., is qualified to take the necessary steps for you. We can make a preliminary search on your invention, advise you whether we think it can be patented, and prepare your application for patent.

Unless you are fully familiar with the U. S. Patent Laws, we recommend that you engage the services of a Registered Patent Attorney to protect your interests. The patent laws are *your* laws. A patent gives you the right to prevent others from making, using or selling the invention claimed in your patent for a period of 17 years.

Use these patent laws for your protection. Investigate whether your invention can be patented. If you have what you believe to be an invention, we suggest that you have this firm make a search for you.

Send for a copy of our Patent Booklet entitled "How To Protect Your Invention," containing information about patent protection and patent procedure. Along with this we will also send you an "Invention Record" form, for your use in writing down and sketching details of your invention. We will mail them promptly. No obligation. They are yours for the asking.

McMORROW, BERMAN & DAVIDSON

Registered Patent Attorneys

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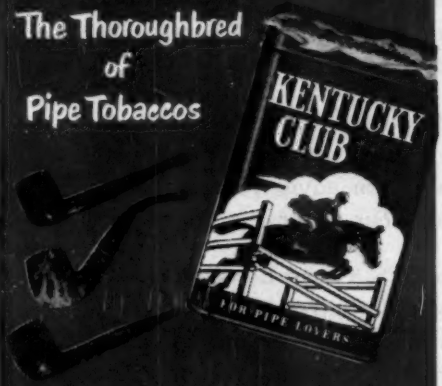
142-Y VICTOR BUILDING, WASHINGTON 1, D. C.

SWITCH TO

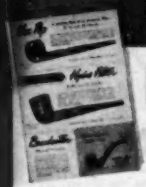
MILD

KENTUCKY CLUB

The Thoroughbred of Pipe Tobaccos



Get Fine Pipes at Worth-while Savings — You see it pays to switch to Kentucky Club. It's the thoroughbred of pipe tobaccos—choice white burley specially blended to give you a mild, smooth smoke with great taste and aroma. In addition, every package of Kentucky Club contains a valuable Dividend Coupon. Save these Coupons and get your choice of fine pipes at *big savings*. Beautiful pipes of imported briar made by expert craftsmen. 14 shapes. Do these two things today. Buy your first tin of Kentucky Club. Mail coupon for free catalog.



FREE Illustrated catalog showing Kentucky Club Dividend pipes and other premiums.

Mail Pouch Tobacco Co., Dept. 51
Wheeling, West Virginia

Please send—free—Kentucky Club Catalog.

Name.....

Street.....

City.....State.....

new-car specifications. Sometimes you use the heading "Piston travel (in feet per car mile at 20 m.p.h.)."

I know that piston travel per car mile in high is a useful figure to know, since it's a way to estimate the rate of engine wear and hence time between overhauls. But why in the name of good sense do you specify "at 20 m.p.h."? It doesn't make a blessed bit of difference how fast the car is going. The piston travel per mile is just the same if you're going 20 or 80.

CLARENCE HOLME, Portland, Me.

Speed makes a difference. The reason, of course, is that centrifugal force varies the effective diameter of the rear wheels. According to a test engineer for a major Detroit manufacturer, 6.00 by 16 tires have a diameter of about 27 inches at rest under normal load and inflation. To cover one mile, they must turn 747 times. But traveling at 80 m.p.h., the tires "grow" in effective diameter by 19/64 inch. Thus they can cover the same mile in only 738 turns, about nine turns less. Therefore, given a rear-axle ratio of 3.9 to 1 and an engine stroke of 4¾ inches, a piston will travel some 25 fewer feet per mile at 80 m.p.h. than at a very low speed. That's a reduction of slightly more than one percent.

The Great Cotton Mystery

I disagree with the U. S. Bureau of Entomology's statement that a wad of cotton on

a screen door is of no use in keeping flies away [PS, Aug., p. 8]. I have found it 85 to 90 percent effective.

J. D. MACK, Encino, Calif.

. . . The flies think the cotton is a spider web and stay away.

P. H. LOGAN, Calhoun, Ga.

. . . They mistake it for a giant white moth which is their deadly enemy.

EDW. L. MEAD, University City, Mo.

. . . The Bureau apparently failed to test the cotton with DDT on it. Then it works.

F. V. SPENCE, Norwood, La.

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TELEVISION

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Use REAL commercial-type equipment to get practical experience

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In addition to easy-to-read lessons, you get the use of HOME MOVIES — an outstanding training advantage — plus 16 big shipments of Electronic parts. Perform over 300 fascinating experiments for practical experience. Build and keep real commercial-type test equipment shown at left.

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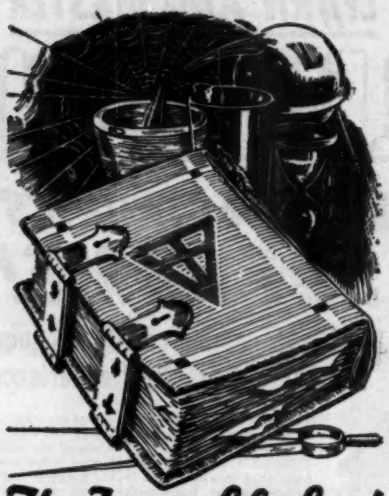
Without obligation, I would like your late News-Bulletin showing 89 ways to earn money in Television-Radio-Electronics . . . and how I may prepare to get started in this thrilling field.

Name..... Age .....
Street..... Apt. .....
City..... Zone..... State.....

SECRETS ENTRUSTED TO A FEW



The Unpublished Facts of Life

THERE are some things that can not be generally told—*things you ought to know.* Great truths are dangerous to some—but factors for *personal power* and *accomplishment* in the hands of those who understand them. Behind the tales of the miracles and mysteries of the ancients, lie centuries of their secret probing into nature's laws—their amazing discoveries of *the hidden processes of man's mind,* and *the mastery of life's problems.* Once shrouded in mystery to avoid their destruction by mass fear and ignorance, these facts remain a useful heritage for the thousands of men and women who privately use them in their homes today.

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The Rosicrucians (not a religious organization), an age-old brotherhood of learning, have preserved this secret wisdom in their archives for centuries. *They now invite you to share the practical helpfulness of their teachings.* Write today for a free copy of the book, "The Mastery of Life." Within its pages may lie a new life of opportunity for you. Address Scribe A.G.Y.

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700-16	5.96	670-15	6.26	600-20	9.95	1000-20	22.50
750-16	6.96	700-15	6.56	650-20	10.75	1100-20	22.50
550-17	5.96	710-15	6.36	700-20	12.45	1000-22	19.50
525-18	5.56	760-15	6.56	750-20	13.48	1100-22	20.25

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The new Sprayberry "package" plan includes many big kits of genuine, professional Radio-Television equipment. While training, you perform over 300 demonstrations, experiments and construction projects. In addition, you build a powerful 6-tube standard and short wave radio set, a multi-range test meter, a signal generator, signal tracer, many other projects. All equipment is *yours to keep* . . . you have practically everything you need to set up your own service shop. The Sprayberry book-bound lessons and other training materials . . . all are yours to keep.

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City..... Zone.... State.....
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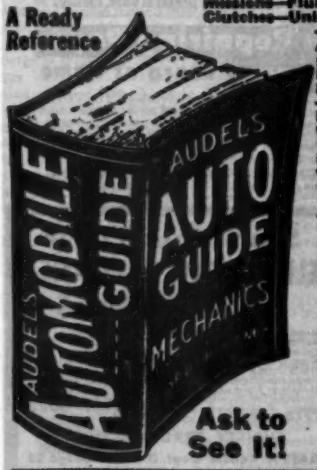

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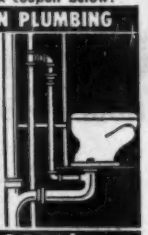

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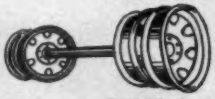

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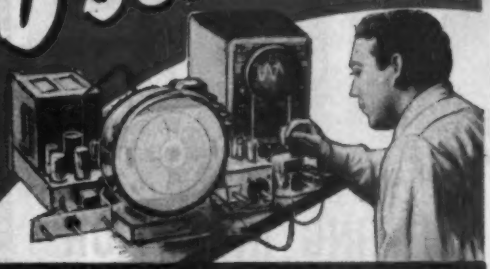

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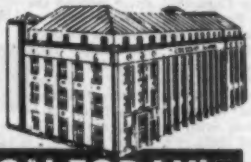

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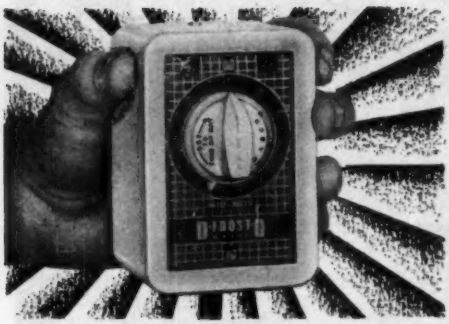

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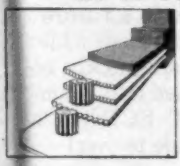

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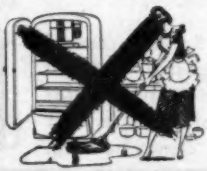

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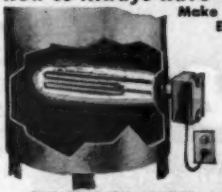

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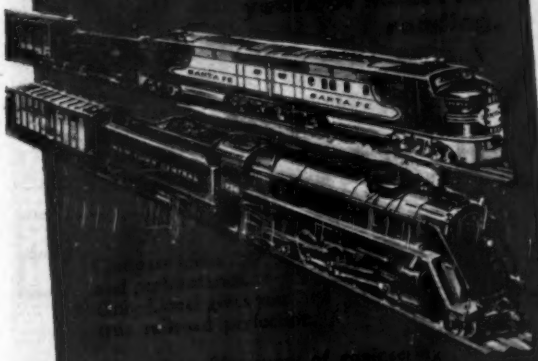

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700-16	5.94	700-15	6.54	700-20	11.94	1100-20	18.54
750-16	7.94	710-15	6.3-	32x6(8)	10.54	1000-22	17.54
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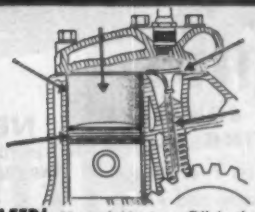

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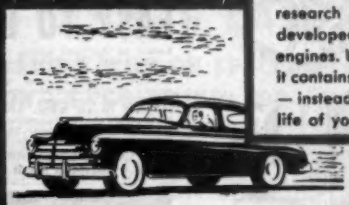

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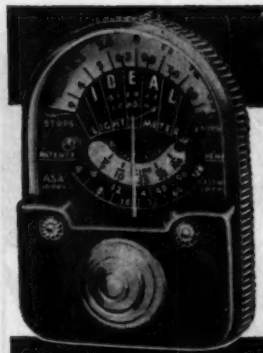

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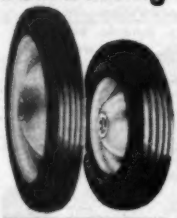

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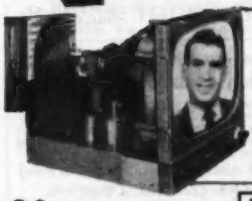

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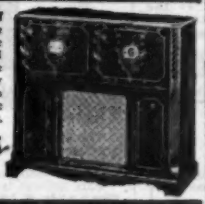

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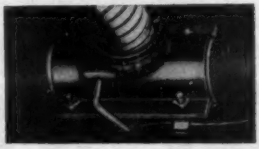

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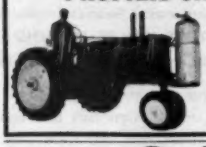

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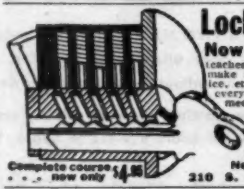

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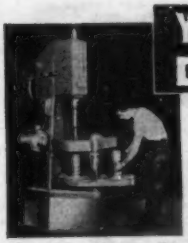

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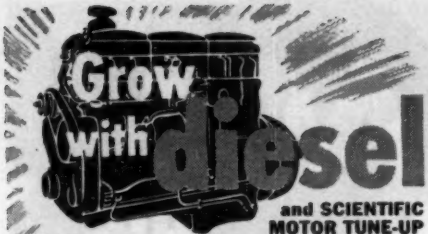

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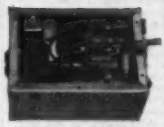

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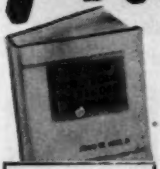

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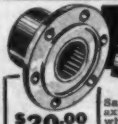

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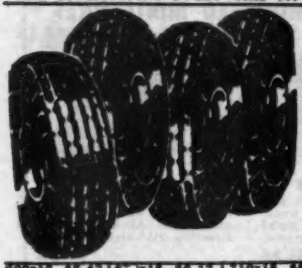

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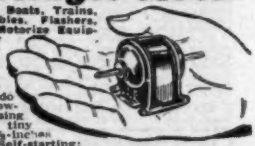

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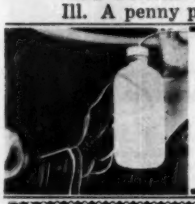

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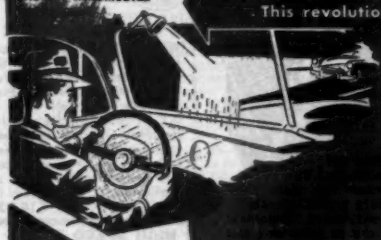

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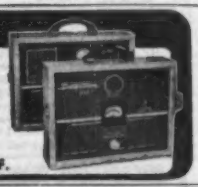

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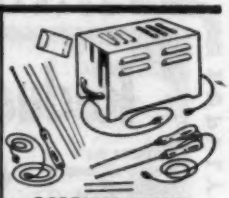

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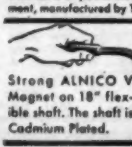

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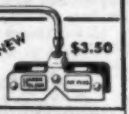

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PRINT without a printing press! Big Profits! See page 61.

FAST selling "magic" mirrors, easy to make. See through back. $5 for complete instructions. Further details free. Carroll Novelties, 232 Merrimon Avenue, Asheville, North Carolina.

$10,000 YEARLY possible, fantastic new demand, raise Angora Rabbits, stock furnished, production bought, literature free. Don't wait, get on ground floor. Address, Mullins & Co., Windsor, Missouri.

$250 WEEK reported! Free book "505 Odd, Successful Businesses." Work home! Expect "Odd"!! Pacific-34B, Oceanside, California.

WIN contest money. General Contest Bulletin gives hundreds of tips. List current contests and rules. Sample 25c. General Contests, 1609-A East 5th, Duluth, Minnesota.

$10,800 PROFITS At Home! Lifetime Opportunity! Free advertising method builds your own Home Mailorder Business! Capital, experience unnecessary. Start spare time. No merchandise investment! No advertising risk! Exciting; practical. Copyrighted, notarized proven successful plan 25c. Satisfaction guaranteed! Treasury, 149 Storer, New Rochelle 1-P, New York.

$$$ IN Personalized Baby Record Books. Sell By Mail Use Same Literature We Do. No-Co-Ro, Oakland 6-P, Calif.

FREE Sample copy, leading mailorder publication. Worthwhile moneymaking opportunities included. Stamp Appreciated. Variety, 57-S Circuit Ave., Newton Highlands 61, Massachusetts.

DOLLAR Maker "Tips." Ask for folder. Louis Wiltsch, Steelville, Missouri.

$100-$200 WEEKLY. No selling or manufacturing. Part or full-time. Mahaffey, 3032-A Weldon, Los Angeles 65.

WE pay you highest rates for hand-decorating greeting cards. Work at home. Experience unnecessary. Greetings, 120 Madison, Detroit 26.

MAIL Order Agency at home. Receive $3.00 orders and keep entire amount. Mail (25c) for samples & instructions. P. S. Acme, 1311 Widener Bldg., Phila. 7.

EARN extra money! Spare time. Write —D'Yarmett, 245 Church, Newark, Ohio.

PLATING outfit, refinish metal parts, no tank required, information free. Norwood Plating Co., Norwood 2, New Jersey.

ANY Formula Furnished $10.00. Lab-ert, Box 327, Tucson, Arizona.

ASSEMBLE and sell Beautiful Swiss Musical Churches. Complete Kit $3.95 P.P. Piltzecker Imports, Wood-Ridge, N. J.

WHAT you sell is free. Only cost, advertising. Plan $1.00. Meixell, Box 261, Boothwyn, Penna.

39 FORMULAS, PLANS, ETC.

FORMULAS, trade secrets, for nearly everything. Catalog free. Creative Publishers, Winnetka 7, Illinois.

FORMULAS—All kinds. Latest products. Literature free. Kemico, Park Ridge 15, Ill.

FORMULAS for big-profit, fast-selling products. Free literature. Majestic, 530½ S. Main, Elkhart, Indiana.

LABORATORY tested formulas. Lists free. Pont, Box 635-PS, Terre Haute, Ind.

FREE formula Catalog. Anything analyzed $25.00. Western Chemical, Salem, Oregon.

40 PLASTICS

LUCITE, Plexiglas. Any size sheets masked Square foot (12 x 12) cost 1/16" $1.20; ⅛" $1.40; 3/16" $1.75; ¼" $2.08. Include 10% postage. Almac Plastics, 230 Fifth Avenue, New York 1, New York.

HI-Profits—Gifts—Jewelry—Free catalogue, details. Pilot Plastics, 67-B Fulton St., New York City 38.

PLASTIC Sheets, Rods, Tubes, etc. Free List. Plastic Supply Co., 2901 N. Grand Blvd., St. Louis 7, Mo.

NEW liquid plastic. Clear, colors. Cast without heat. Embed flowers, insects, coins. Saw, drill, carve. Send 25c for Wholesale Catalog and New Sales Manual showing how to make money at home. Castolite, Dept. L-102, Woodstock, Illinois.

LUCITE, Plexiglas, acetate; casting, molding plastics, findings. Dye manufacturer. Quantity prices. Special bargain lots. Immediate shipment. Complete catalog 10c, 25c airmailed. Gem-O'-Lite, Box 6864, North Hollywood, Calif.

REPAIR False Teeth with Flint-lok! New sensational self hardening dental plastic. Generous supply handles twelve repairs. Outfit complete with instructions only $5.00. Grant Dental Laboratory, 219 W. 7th St., Los Angeles 14, California.

PLASTICRAFTERS supplies wholesale. Literature 20c. Cosmopolitan, Box 176-PS, New York 8, N. Y.

41 CHEMICALS & APPARATUS

NEW Idea Chemical and Apparatus Outfits for Home Experimenting, Photo-Scales, Microscopes, Chemicals, Biological and Laboratory Supplies in Small Quantities. Catalog 25c. Established 1931. John H. Winn, 124-B West 23rd Street, New York 11, N. Y.

LUMINOUS Paints will glow in dark. Six colors. Fairmount Chemical Co., 136 Liberty St., New York City 6.

LABORATORY Apparatus, Chemicals, Microscopes, Complete Chemistry Sets, Minerals, Uranium Ore. 10c brings catalog. Porter Chemical Company, Hagerstown 2, Maryland.

SPECTROSCOPE for quick chemical analysis $3.00. Cutting Sons, Los Altos, Cal.

ILLUSTRATED Catalog: Chemistry, mineralogy, biology, 10c. Tracey Laboratories, Evanston, Illinois.

LEARN Chemical Analysis, complete kits with instructions. Catalog 15c. B. & S. Amateur Chemist Supply, 191-49 115 Ave., St. Albans 12, New York.

CATALOG of chemicals, apparatus, kits, minerals, Uranium ore, 10c. Rex Laboratories, 2849-B Birchwood, Chicago 45, Ill.

CHEMICAL supplies Catalog 15c, refundable. Laboratory Sales, Box 161, Brighton, Mass.

OH Boy! New Book Of Science, Experiments, Formulas, Secret Processes, together with Catalogue of Laboratory Supplies, only 25c. National Scientific Company, Dept. 15, 2204 North Avenue, Chicago 47, Illinois.

CHEMICALS and apparatus for industrial, analytical, and private laboratories. Catalog 15c. Dept. M-26, Biological Supply Co., 1176 Mt. Hope Ave., Rochester 20, N.Y.

25 DIFFERENT Chemicals. Ounce quantities $2.95. Al. Ginsberg, 43 Amboy St., Brooklyn 12, New York.

42 HELP WANTED

FOREIGN & Latin American Employment, 1951 "Foreign Service Directory" gives Up-To-Minute Facts on Military & Civilian Construction, Government Jobs, Major Oil Listings, Aviation, Transportation, Steamship Lines, Mining, Importers, Exporters, How-When-Where to apply, application forms, Hot List Firms Hiring. $1.00 post-paid. Global Reports, P.O. Box 983-S, Hollywood 28, Calif.

FOREIGN Employment Construction men, building trades, helpers, office men, others, interested in Foreign Projects. High wages, quarters, trans. Listings of firms actively working on U. S., Foreign, Intercontinental Projects. Send $1 for Foreign Construction Compendium and Application Forms. Foreign Service Bureau, Dept. PS-10, Box 295, Metuchen, New Jersey. (Not an employment agency—no fees.)

ENJOY Tremendous Profits selling Christmas Displays. Annual cleanup for hustlers. Literature Free. AdPro, Box 592-PS, Springfield, Ill.

HAWAIIAN Employment? Complete list sugar pineapple plantations employing 20,000. Send $1.00. Employer's Directory, #3 Campbell Block, Honolulu, Hawaii.

$1,000,000 CONSTRUCTION Projects, "World Wide" printed Monthly Foreign & Domestic employment. Free application blanks tells How-When-Where to apply. $1.00 complete. Global Reports, P.O. Box 883-PX, Hollywood 28, California.

43 AGENTS WANTED

NEW Jobs open in selling! Send name, address for five free issues of Opportunity Magazine's money-making guide, listing hundreds of companies who'll pay you well, full or part-time. No experience needed. Opportunity, 28 E. Jackson, Dept. 18, Chicago 4, Illinois.

DRESSES 18c; Coats $2.00; Blouses 35c; Free Catalogue; Crown, 164-PB, Monroe Street, New York 2.

MAKE Wedding Profits. Sell invitations, napkins, matches. Samples free. Dunbar's, Middlebush 5, N. J.

AGENTS—300% profit selling genuine gold window letters; stores and offices. Free samples. Metallic Letter Co., 437 N. Clark, Chicago.

COMMERCIAL Deep Frying Course. Mock Chicken Legs, Potatoes. New and proven methods. Learn about this moneymaking field. $2.50. PP. Concession, Toledo 13, Ohio.

PHOTO-Salesmen-Agents. Sell beautiful hand colored plastic enlargements and sensational new photo compacts, rings, bracelets, lockets, etc. Collect deposit, we deliver. Profitable sideline. Send card, for Free sample kit. Novel Portrait Co., 3343-A North Ave., Chicago, Ill.

NEED Extra Cash? Take orders for personal initialed belts and buckles, cap badges, tie holders, etc. Choice of 3000 emblems. Free sales kit. Hook-Fast, Dept. 1425PS, Providence, R. I.

NYLON Uniforms. Immediate delivery, immediate profits. Free sales kit. Superior Fabrics, Dept. A-10, 3936 Market, Philadelphia 4, Pennsylvania.

JUST Out! New thrilling sensation in Christmas cards. Make big money! Show lustre foils, satins, brilliants. Amazing values bring easy orders! Christmas cards with name 50 for $1.25 up. Also imprinted book matches, stationery, many gifts. Get 30 Free Samples with name; several $1 boxes on approval. Joy Greetings, 507 N. Cardinal, Dept. M-61, St. Louis 3, Mo.

START Your Own Business on credit. Always your own boss. 1,437 Dealers sold $5,000 to $28,500 in 1950; their average $6,704. We supply stocks, equipment on credit. 200 home necessities. Selling experience unnecessary to start. Wonderful opportunity to own pleasant, profitable business backed by world-wide industry. Write Rawleigh's, Dept. J-U-PSC, Freeport, Ill.

FREE Samples, and amazing plan, giving you gorgeous Dress without penny cost. Rush name today, with dress size. Harford, Dept. E-435, Cincinnati 25, Ohio.

POPULAR SCIENCE OPPORTUNITIES

ANYONE can sell Hoover DuPont Nylon Uniforms for beauty shops, waitresses, doctors, nurses, others. In white and colors. Exclusive styles. Top quality. Low priced. Exceptional income. Real future. Equipment free. Write fully. Hoover, Dept. S-101, New York 11, N. Y.

AT Last! Something new and sensational in Christmas cards. Make extra money fast! Show gorgeous satins, velours, metallics never before offered. Gets easy orders! Pays up to 100% cash profit. Free Samples 30 Christmas cards with name, 50 for $1.25 up. 60 assortments. Personalized book matches and stationery gifts. Several $1.00 boxes on approval. Write Puro Co., 2801 Locust, Dept. 141-M, St. Louis, Mo.

IS $210 a week worth a penny postcard to you? Then rush card with name and address for special Free Trial Plan that sells amazing new Automatic Refrigerator Defroster "like hot cakes!" Write to Mr. Lewis, D-Frost-O-Matic Corp., Dept. PSC-10, 6 N. Michigan, Chicago 2, Ill.

DO you need money? $35.00 is yours for selling only 50 boxes of our 300 Christmas Card line. This can be done in a single day. Free samples. Other leading boxes on approval. Many surprise items. Experience unnecessary. Free samples Personalized Christmas Cards, Stationery, Napkins. Write today. It costs nothing to try. Cheerful Card Co., 373 White Plains, N. Y.

CHRISTMAS Cards At Jobbers Prices! Large selection dollar assortments 35c each in hundred lots. Imprint Cards, Money Folders, Gift Cards, Pictures, etc. Make more profits selling our line! Catalog free! Three sample boxes $1.00. Elfco, 438 North Wells, Chicago 10.

BRAND New! Amazingly different and smart Christmas cards bring you big money! Take easy orders fast. Pays up to 100% cash profit. Christmas cards with name 50 for $1.25, up. Big line. Personal stationery and book matches. Get sample assortments on approval, imprints Free. Write today. North Star, 31 Glenwood, Dept. 19-A, Minneapolis, Minn.

FREE Merchandise to new customers ($1.50 retail value—your selection). Sensational "get acquainted" offer. Rush 25c for Illustrated Wholesale Bargain Catalog and Free Merchandise certificate. Save up to 50% on 2,000 everyday necessities and novelties. Reliable Jobbers, 311-J North Desplaines, Chicago 6.

MAKE money selling ties. Free catalog. Write to Philip's Neckwear, Dept. 830, 20 West 22 St., New York.

300% PROFIT—Postage stamp photos from negatives or prints, perforated sheet form, gummed backs. Free details, samples. National Photostamp Co., 1418-P Third Ave., New York 28.

BE A Money Maker . . . Represent magazines year around. Wonderful home work. Big Christmas profits now. Liberal commissions. Everything furnished. Write for Free catalog. McGregor Magazine Agency, Dept. 510A, Mount Morris, Ill.

SHINE Shoes Without "Polish." New invention. Lightning seller. Shoes gleam like mirror. Samples sent on trial. Kristee 135, Akron, Ohio.

GOLD Lacquered and Silver Sign Letters. Windows, Doors, Trucks. Standard sizes. Penny each. Free samples. Atlas-G, 544 West 79th, Chicago 20.

ABSOLUTELY Free! Big package actual sample fabrics and style presentation of dresses, lingerie, hosiery, etc. Take orders. Commissions big. Send no money. Melville Co., Dept. 6315, Cincinnati 25, Ohio.

OWN A Big Moneymaking New and Used Clothing Business. Men's used suits $2.00, pants 35c, topcoats $1.25, Jackets 60c, shoes 20c. No experience necessary. Free wholesale catalog. Superior, 1250-B Jefferson, Chicago 7.

NEW Plastic Mending Tape. Just press on! Repairs clothing instantly. Lightning seller. Samples sent on trial. Kristee 134, Akron, Ohio.

SENSATIONAL money maker—washable woolen slacks, skirts, shirts—plaids and solid colors. Nationally advertised "Sanforlan" label. Nylon reinforced, childrens, teen-age. Terrific repeat business. Bonus Plan. Start immediately. Free Sales Kit. Wash-Em, Westport 23, Conn.

HI-Profits—Gifts—Jewelry—Free catalogue, details. Pilot Plastics, 67-B2 Fulton St., New York City 38.

WHERE to Buy 800,000 articles direct from Manufacturers. Save by buying direct. Sent Free. "Your Profits Under The Spotlight." Glass Pub. Co., Ellwood City 4, Pennsylvania.

I'LL Put A "Shoe Store Business" In Your Pocket! Nation's Leader trains you to make Big Money! Fit men, women. Free Sample Outfit—Write Today! Consolidated Shoe System, Dept. 335-F20, Chippewa Falls, Wisconsin.

CALENDARS, Advertising Novelties, Matches, All styles, including Religious. Varnished, 12 Sheet, Girls, Hundreds of Advertising Novelties, Book Matches, etc. Fleming Calendar Co., 6539 Cottage Grove, Chicago 37, Illinois.

BIG Daily Profits—selling embroidered wool and cotton uniforms, initialed buckles, belts, badges, choice 3,000 emblems. Free sales kit. Hook-Fast, Box 460PS, Roanoke, Va.

SHUFFLE, Pin Game, factory direct. Mazuma! Webb Distributing, 4966 West Chicago Ave., Chicago 51, Ill.

MAKE Extra Xmas Money In Your Own Wholesale business. Write for our Free illustrated wholesale catalog listing gifts, watches, jewelry, premiums and toys at prices below the wholesale market. Distributors to the trade for twenty years. We accept sample orders. Write today! O. Faust, 223 N. 8th Street, Dept. PS-1051, Phila. 6, Penna.

WHY Lug Heavy Cases? Carry samples of Efficiency Cards in pocket. Earn to $35.00 daily, spare time. Dealers, jobbers, manufacturers, drug, hardware stores need 'em. Reasonably priced, good commissions. Samples, details to sincerely interested over 21. Write today Efficiency Products, Hawthorne, New Jersey.

BIG Profits In Spare Time! I'll send Free Assortment Full-Size Samples fine foods, household necessities to ambitious Men—Women who need money. Friends, neighbors buy eagerly. Send no money. Just write Blair, Dept. 55GT, Lynchburg, Va.

BUY wholesale 25,000 items, catalogue 25c. Matthews, 1472-A3 Broadway, N.Y.C.

SUPER liquid mender fixes most anything, including wood, metal, glass, fabrics. Tube, 35c postpaid. AA, 2216 Mobile, Chicago 39, Ill.

ULTRA-Blue Stock Signs—7c. Sell 35c. 2,000 slogans, 7"x11", comedy, religious, general. 15 samples $1.00. Lowy, 812-ST Broadway, New York 3.

HOW would you like to get paid for "giving away" first quality nylon stockings at 49c? That's all they cost if they run within guarantee period to three months! Advance cash—big bonus. No experience needed. Just write orders. We deliver—collect. Postcard brings you free sample stocking and sales outfit prepaid. Kendex Corp., Babylon 14, New York.

SALESMEN, Distributors, fast selling costume jewelry direct from factory. Big picture catalog free. Pickcraft, C-19 Bank, Attleboro, Massachusetts.

SELL nylons! No experience, no money needed. Highest commissions. Lowest prices. Highest quality. Money back guarantee. Write for free sales kit. Lido Hosiery Mills, 149 Church Street, Dept. F-1, New York.

AMAZING easy earnings. Make $3.00 to $5.00 an hour spare time. Show friends, neighbors our new sight-selling Christmas, Everyday cards, wrappings, stationery, gift items. Also get extra bonuses and valuable merchandise prizes. Send today for 30 Free imprint samples and boxes on approval, with complete instructions. Prompt service. Bob-Art Greetings, Dept. L-112, 278 Washington Ave., Chelsea 50, Mass.

SALESMEN, Money-making sideline, Calendars and Advertising Specialties. Highest commissions advanced. Free New Cars. Rush name. Advertising Specialty Manufacturing Co., Brooklyn 36, N. Y.

FALL Sales. Self-propelled rotary mowers, 20"-32". Cuts everything. Farm Products-PS, Excelsior Springs, Missouri.

SELL only 50 boxes of Xmas Cards & Sure $35 is Yours! Sell to friends, neighbors, churches, clubs, etc. in Spare or Full Time. Big, beautiful line includes Wraps, children's cards & books, novelties, name imprinted Xmas cards, religious & regular boxes. Sells 50 for $1.25 & up. Stationery, napkins, matches with name-on. Over 100 numbers. Costs nothing to try. Write For Free Samples On Approval. Rainbow Cards, 38-H E. 1st St., New York City 3, N.Y.

RAT-Deth (cheese flavored). Local franchise. Sell big users. Farm Products-RD, Excelsior Springs, Missouri.

MEXICAN feather pictures. Sell on sight; 200% profit! Free details; sample 10c stamps. Sylvia-SQ, Apartado 9036, Mexico City.

SELL Big Money-Maker to Men and Women. Easy handwork makes fast-selling useful articles. Sample free. Sunmade Company, Brockton 64, Mass.

BUY Wholesale thousands nationally advertised products at big discount. Sent free "The Wholesale Plan." American Buyers' Service, 629-T Linden, Buffalo, N. Y.

PRINTING — Salesbooks — Envelopes — tags. Free illustrated catalog. Ersco, Bronx 61, New York.

FREE — "Booklogues!" Novelties! Money-makers! "Police Jiu-Jitsu." 50c! Hirsch, Spring Valley 3, New York.

BE Our Catalog Representative. Contains household, TV, general Merchandise items. We supply everything free, no expense for you. Write: Teleron Company, 41-05 Lawrence, Flushing 55D, New York.

BARGAINS!! Save up to 50%. Balloons, combs, novelties, notions. Carleton House, (PSM), Texas City, Texas.

BELOW Wholesale. Watches, Jewelry, Appliances, Premiums, Silverware, Cookware. Collins Co., Forsyth 2, Georgia.

FREE book "505 Odd Successful Businesses." Work Home! Expect something Odd! Pacific-34B, Oceanside, Calif.

SELL new clothing. Lowest Prices. Operate from home, auto, store. Enormous Profits. Big Catalog Free. S&N, 605-D 12th Place, Chicago 7.

A A A. Sensational Talking Christmas & Birthday Cards. Pull tape and card clearly says "Merry Christmas." 150% profit. Retails 25c. Sample 25c, five for $1.00 with wholesale prices. Minas, P. O. Box 18214-R, Los Angeles 33, Calif.

NICKEL Silver key checks—Key check stamping Outfits. Catalog free. General Products, 11PS No. Pearl, Albany, N. Y.

EXTRA money quick. Sell "NuSilver Polish and Plating Liquids". Cloth applied. Particulars free. NuSilver, 508-PS10, New York St., Aurora, Ill.

44 HIGH-GRADE SALESMEN

MAKE Money with famous, easy-selling Bostonian shirts—spare time, full time, sideline. Fabrics, outfit Free. Bostonian, 89 Bickford, Dept. G-11, Boston 30, Mass.

EARN Big Money Fast! Sell finest-quality advertising work uniforms to garages, factories, filling stations, etc. Free selling kit. Topps, Dept. 5410, Rochester, Indiana.

ADVERTISING book matches—Cash in on big demand—sell Union Label matches. Cuts for all businesses and political parties—Free powerhouse selling kit—low prices—protection guaranteed on repeat orders—Cash commissions. Superior Match Co., Dept. P-1051, 7530 Greenwood, Chicago.

MAKE money showing neighbors how to beautify yards with glorious flowering shrubs and trees. Quick-bearing Dwarf fruit trees; World-Famous Stark Patented Varieties produce abundant harvests champion-quality apples, pears, peaches, other fruits. Even small plots produce fruit for family-use and to sell. Beautiful Sales Kit Free. Stark Bro's., Dept. 30102, Louisiana, Missouri.

AD Matches! Sell Amazing Designs—30, 30, 40 and 240-light book matches. Biggest spot cash commissions; every business a prospect. Low prices for high quality. Repeats. Start without experience; men, women; full, part time. Buy Nothing! Sales kit furnished. Match Corp., Dept. PS-22, Chicago 32, Illinois.

UP to $50.00 in a week spare time and tailored suit for yourself without paying one cent. Write for plan and Free Sample Case. Pioneer Tailoring Co., Congress & Throop St., Dept. Y-1121, Chicago 7, Ill.

"PENSILUBE" New scientific lubricating pencil for home, shop, office. Salesmen write Reardon Products, Peoria, Illinois.

SELL Advertising Specialties and Executive Gifts for old established firm. Good thing for man with wide acquaintance among business firms. Opportunity for hustler who likes to make money and isn't afraid to make calls. Develop your own business with no investment. Leads given after you are established. Best selling season now on. Write today. Newton Mfg. Co., Dept. PS, Newton, Iowa.

A Pair Of Shoes As Bonus. Big money making shoe line. Men's, women's dress, work shoes and boots. Newest Spring-Step Cushion construction. Lighter, softer, longer wearing, lower price. Ortho-Vent, S-1051, Salem, Virginia.

WANT to make real money? You can positively make $50.00 a day and up selling a brand new item going to every type of food and beverage store, factories, Laboratories, Hospitals, etc. First time advertised. Write for Free Details today. Johnson-Hartman, 53 West Jackson Blvd., Dept. PS-10, Chicago 4, Illinois.

45 EDUCATIONAL & INSTRUCTION

USED Correspondence Courses and Books sold and rented. Money back guarantee. Catalog free. (Courses Bought). Lee Mountain, Pisgah, Alabama.

HIGH School—No Classes. Study at home. Spare time. Diploma awarded. Write for Free catalog HBA-6, Wayne School, 2527 N. Sheffield, Chicago 14, Ill.

BOOKKEEPERS! Increase your earnings! Operate your own simplified "Dollar-A-Week" Bookkeeping and Tax Service. Full or spare time. Details Free. No obligation. Ellis, Box 203, Cedar Grove, N. C.

START a Collection Agency business. Very profitable. Quickly learned. Write Cole & Associates, Syracuse 2, N. Y.

PIANO Tuning Pays. Learn this profitable profession at home. Our Tonometer and mechanical aids make learning easy. No knowledge music necessary. Diploma granted. Largest and oldest school—51st year. G. I. Approved. Write for booklet. Niles Bryant School, 77 Bryant Bldg., Washington 16, D. C.

$200 WEEKLY Reported! No selling. Free booklet. T. J. Surface, Roanoke 4, Va.

MEDICAL Laboratory Technicians in great demand. We train you in your own home. Catalogue free. Imperial Technical Institute, Box 973-B, Austin, Texas.

LEARN Tailoring in one of America's finest tailoring schools. Write book 10. Empire Institute of Tailoring, 422 East 5th, Hazleton, Pa.

BECOME a Doctor of Psychology or Metaphysics. Teach secret of contentment, happiness. Win degree of PsD. or MsD. Solve mental worries. Free book. College of Universal Truth, 5153-K N. Clark, Chicago.

LEARN Piano Tuning, Repairing—at home in 30 days. Unlimited income. Phonograph recordings, tools and instructions furnished. Write Capitol City Tuning School, Department C-1033, 129 East Michigan, Lansing 16, Michigan.

EVERLASTING Life. The long awaited desire of man to find scientific proof of eternal life is fulfilled. Stated in simple practical language of electomagnetic physics which opens new fields of endeavor and leading to ultimate instrumental communication. Send $1.00 today for your introductory copy, postpaid. Timely Publishers, 911 So. First St., Yakima, Wash.

LEARN Auctioneering at home working with successful auctioneer. Revolutionary method provides classroom training in spare time. $100,000 daily often earned by trained auctioneers. Advance Auction School, 5044 North Newark, Dept. 204, Chicago 31.

MIDLAND Linotype School, Charles City, Iowa. Civilian, Veteran courses. Free placement.

PRACTICAL Nursing—Learn Easily at Home, Spare Time. Big demand, good earnings. High School not necessary. Write for free facts. Wayne School, Dept. PH-3, 2525 Sheffield, Chicago 14, Ill.

USED Correspondence Courses and Educational Books Bought, Sold, Rented. Catalog Free. Educational Exchange, Summerville, Georgia.

U. S. Gov't Jobs! Men—Women. 50,000 jobs open now! Start high as $66.34 week. Experience usually unnecessary. Can you qualify? Get Free 32-page book—showing jobs, salaries, requirements, sample tests. Write: Franklin Institute, Dept. B-22, Rochester, New York.

STOP forgetting. Good memory pays. Newly discovered method brings amazing results. Memory Institute, Box 261-S, Staten Island 1, N. Y.

WELDING training pays at Hobart Welding School, Box P-1012 Troy, Ohio. VA Contract. Best equipment. Catalog Free.

INCREDIBLE! Unprecedented! Look under "Personal!" Bijou, Box 1727-VG, Hollywood 28, Calif.

WAKE Up your winning ability. Activate your idle success powers. End money worries. Get ahead. Enjoy living. New thought-control Behavior-Mastery method gets results in every case or no cost. Details sent free. School of Personal Psychology, Tenth Floor, Washington Bldg., Louisville 2, Ky.

ALGEBRA, Trigonometry, Calculus. Individualized instruction. Free details. New Correspondence School. Box 27, St. Johns, Brooklyn 13, New York.

BOOKKEEPERS! Read, "What you should know about a bookkeeping service", 25c. James, Box 1281, Lubbock, Texas.

SCIENCE of memory amazingly simplified. New book. Information free. Memorology Studio, 2016-S Sunnyside, Chicago 25, Illinois.

HAIRCUT as you like it. Booklet tells how 25c. Mastrolia, 5½-BC, Jane, New York City 14.

COCKTAIL Lounge Bartending and Management. Home study or School Training. American Bartending School, P-334 S. Wabash Avenue, Chicago 4, Illinois.

EARN $50.00 daily, home or office. Rush season coming. Details Free. Universal, Box 664-P, Springfield, Missouri.

FOR as little as $8.00 you can put your ad here in the December issue. Get in on the Christmas mail-order rush and deliver your sales talk direct to the 3,992,000 readers of Popular Science. Special classification "Christmas Gifts"—available for this issue. Same low rate you've always paid—80c a word. The December issue closes on October 25th! Write today for order blank and free booklet, "How To Make Money Out of Classified Advertising." O. K. Kelly, Classified Advertising Manager, Popular Science Monthly, Dept. B, 353 Fourth Avenue, New York 10, New York.

47 DETECTIVES

DETECTIVES—Work home—Travel. Experience unnecessary. Detective Particulars free. Write, Wagoner, P-125 West 86th, New York 24.

SECRET Service, fingerprint training at home, in spare time. Write, Associated Special Investigators, Box 474, Saint John, N.B., Canada.

48 LANGUAGE OUTFITS

LISTEN and Learn A Language by Linguaphone. At home, quickly, easily, correctly master Spanish, French, German, Russian, Asiatic—any of 29 languages through Linguaphone Conversational Method. Add to service, job, travel opportunities. Send for Free book. Approved for Veterans' Training. Linguaphone Institute, 5410 Rockefeller Plaza, N.Y.C.

50 BUSINESS SERVICE, INFORMATION, NAME LISTS

MAILORDER Operators! 1,000% profit selling "No Risk Radio Advertising" plan! 400 broadcasters; commission basis! Exciting details, 15c. Herbert Simon, 50 Park Avenue, New York City 16.

MAILING Lists. All kinds 1000 $5.00. Dixie Service, King, N. Carolina.

RAISE Capital for any legitimate business proposition under the Ideal System. What's your problem? Tucker, Business Service, 3633 Warder St., N.W., Washington 10, D. C.

13,000 NAMES College Teachers. $10.00. Lynch List, 402-APC Hazlett, Baltimore.

51 SPECIAL SERVICES

ARTIFICIAL Eyes. The world's finest true-to-life artificial eyes of plastic. Won't break, roughen, or discolor. Send old, well-fitting-eye even though cracked and discolored, I will make one exactly like it in plastic. $25.00. Money-back guarantee. Dr. H. R. Patrick, D.D.S., 406-A Whitehead Bldg., Atlanta, Ga.

SILVERPLATING special. Creamer & Sugar $7.50. We do all metal plating. Send to Dresden Silverplaters, 957 E. Jefferson, Detroit 7, Mich.

52 AUTHORS SERVICE

"TEN Steps To Writing Success" reveals How you can write stories, poems, articles for publication. Details Free. Will Herwell, 7016 Euclid, Cleveland 3, Ohio.

I Want New Writers. Experience unnecessary. Earn at home, spare time. Details Free. Saunders M. Cummings, 468-15 Independence Bldg., Colorado Springs, Colo.

53 ADVERTISING

ADVERTISE: 24 words, 40 Newspapers, $3.50. Lists Free. Advertising Bureau, 10511-P Springfield, Chicago 43.

24 WORDS in 50 Weeklies, $4.95. H. J. Darnell, 730 Hays, Jackson, Tennessee.

ADVERTISE: 40 Texas Weeklies, $3.50 (24 Words). M. Pennebaker, Kerrville, Tex.

54 CARTOONING, SIGN PAINTING, CHALK TALKS

"HOW To Make Money With Simple Cartoons"—A book everyone who likes to draw should have. It is free; no obligation. Simply address Cartoonists' Exchange, Dept. 1910-C, Pleasant Hill, Ohio.

BE smart. Get in Art. Let me start you Free. Nick Nichols Arts, PS, 39 West Adams, Chicago, Illinois.

YOUR Cartoon drawn by an experienced cartoonist. Send Photo and 25c to Cartoonist, Newtown, Conn.

BARGAINS on Famous Art Courses, Moneymakers for Amateurs, etc. Literature free. National Artists, Dept. C, 801 North Marsalis, Dallas 8, Texas.

CHALK Talks. Laugh Producing Program. $1.00. Illustrated Catalog 10c. Cartoonist Balda, Oshkosh, Wisconsin.

SIGNS increase sales economically. We make 'em! Most any kind. $1.00 up. Postal brings suggestions and prices free. Or send us your requirements. Signpost, 200 Mardick Rd., Richmond 24, Virginia.

55 TYPEWRITERS & OFFICE MACHINES

PRINTOMATIC selffeeding Post Card printing Duplicator $15.75. Envelope Addressing Machines $24.50. Pittsburgh Typewriter Company, 336-O Fourth Avenue, Pittsburgh 22, Pa.

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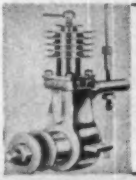

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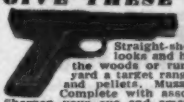

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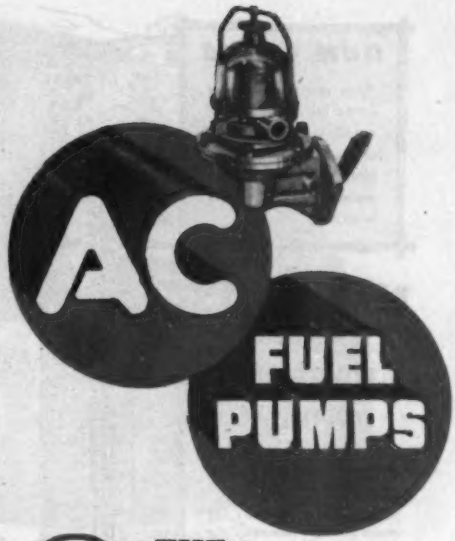

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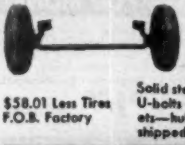

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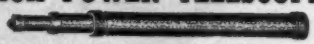

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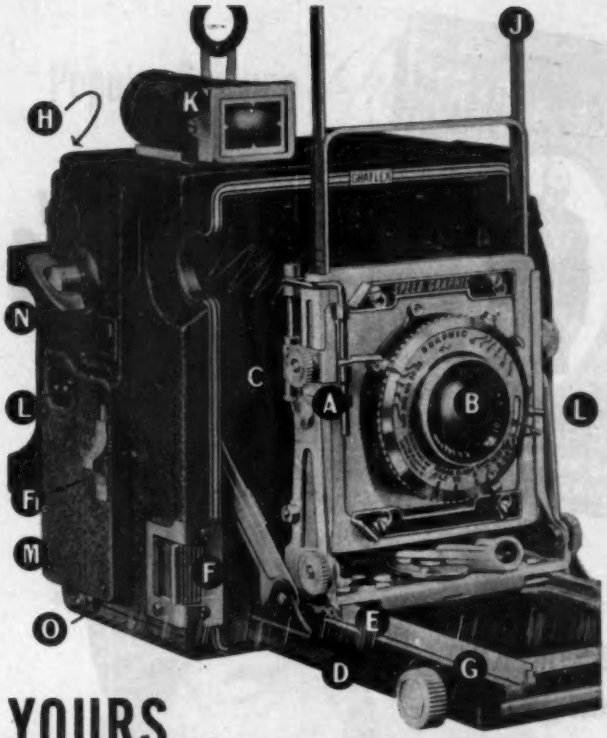

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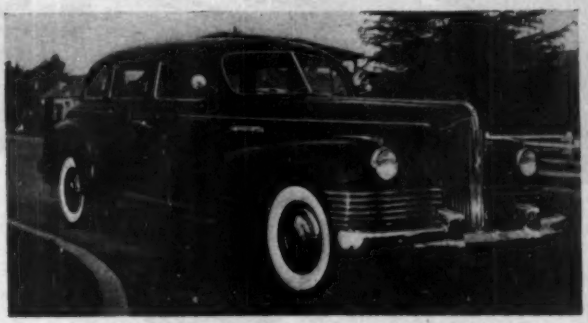
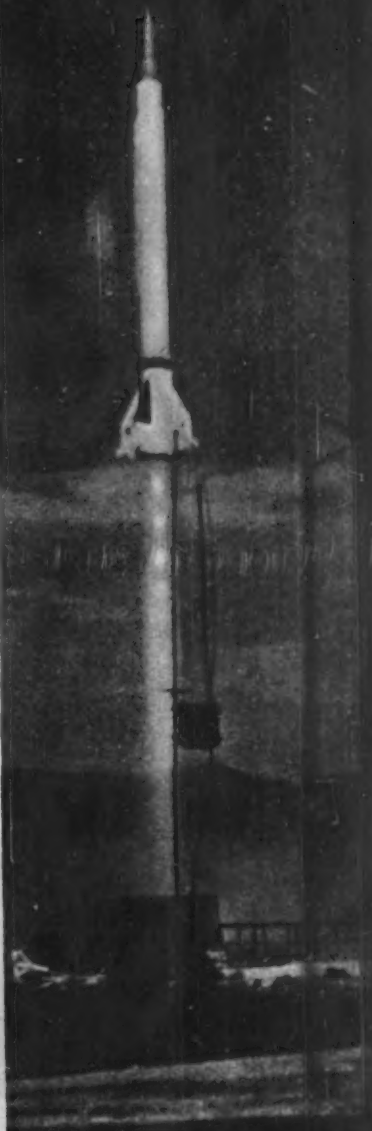
Popular Science *Highlights* This Month

When the bird is on the wing, hunters worry about their aim, not the performance of their shotgun shells. They're sure-fire—thanks to a mass-production miracle that combines 212 manufacturing operations to turn out 1,800,000 shells a day from one plant. Page 170

Used power tools can be good buys for your home workshop—IF you know what to look for and to look out for. Here's how to tell the bargains from the busts. Page 201



The Russian limousine above, a Zis-110, was captured in Korea and sent home to Gen. Walton Walker's widow. It will be on display at the Motorama in Los Angeles next month. You'll find a lot more about Russian cars—the Moskvich, the Pobeda and the rest of the Red auto line—in this issue. Page 106



"Lucky Seven," the Navy Viking, above, recently broke all altitude records for single-stage rockets by soaring 135 miles. The next step toward interplanetary flight may be a man-carrying satellite assembled 1,100 miles out in space to circle the earth. Page 120

A Scientist Previews

The First Atomic Airplane

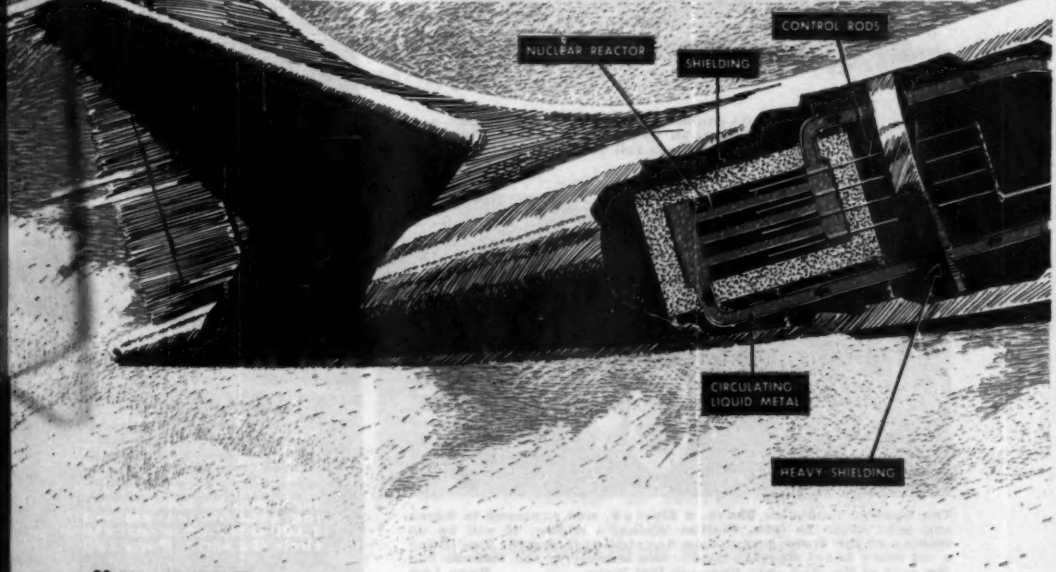
A new era in aviation approaches as official reports hint nuclear power for flying is closer than you think.

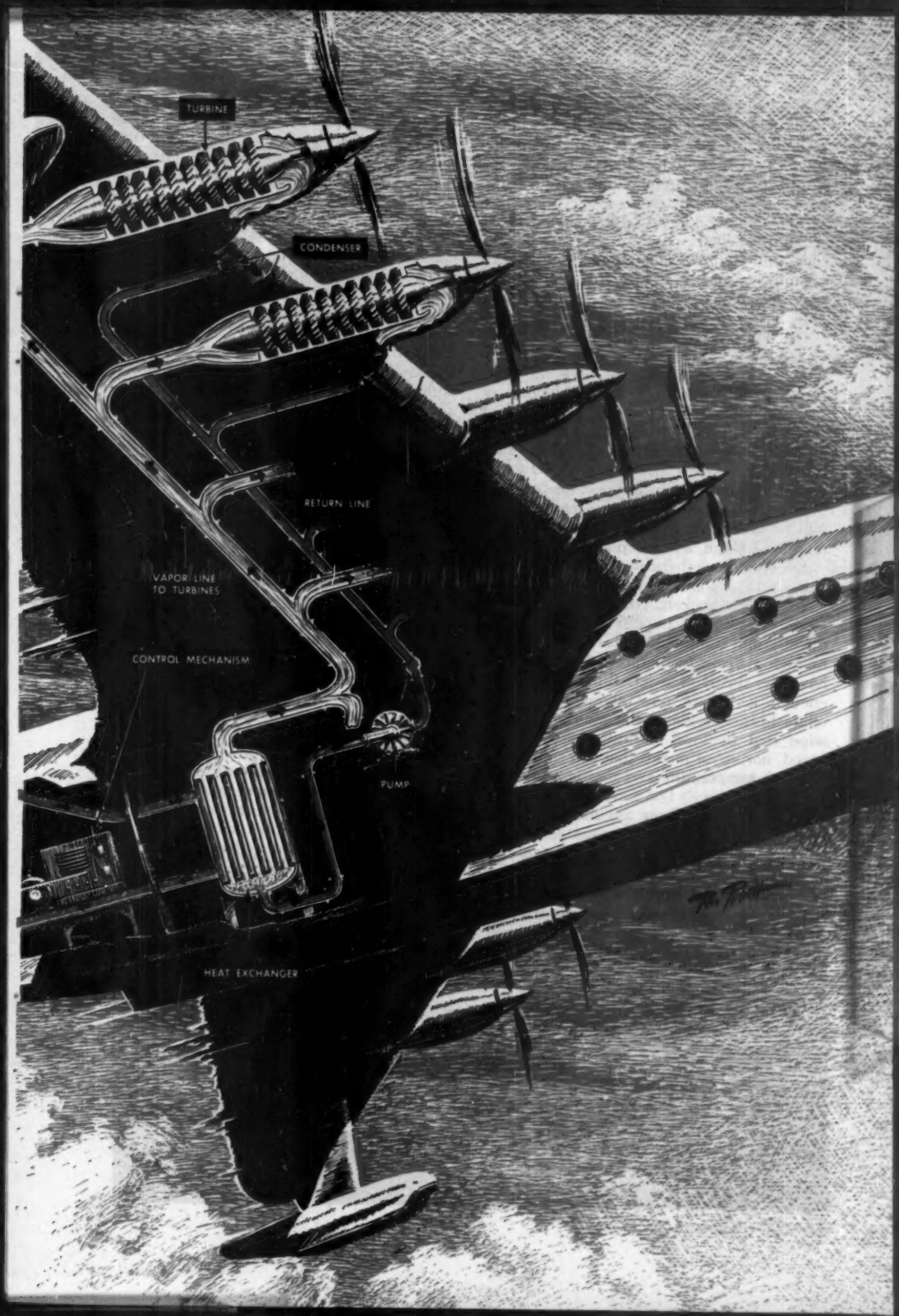
By Gerald Wendt

Author of "Atomic Energy and the Hydrogen Bomb"

THE first atomic-powered plane—already being designed—will be a big plane, probably a flying boat. It will have wide but thin wings to combine lift with high speed. It will have no fuel tanks, yet will be able to stay afloat almost indefinitely. It will run on steam. Its power plant will look a good deal like a yacht's, with a red-hot boiler and turbine engines geared to propellers.

Such a power plant can be built now. A long-range plane that




TURBINE
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can go to the other side of the earth and back again, or all the way around, without refueling, is needed now. And the time when atomic power will be used to extend the range of aircraft tremendously is drawing closer. A carefully worded report by the U. S. Atomic Energy Commission on progress in the first six months of 1951 makes this terse but significant announcement: "Development of reactors to propel military aircraft also advanced."

Squeezing a Pile in a Plane

Yet the first atom plane is unlikely to be either a long-range bomber or a transport plane. Instead, it will be a flying laboratory for the armed services. The power plant probably will be so heavy that it will use up all the weight—up to 50 tons—saved by omitting fuel. Thus the great advantage of atomic power, the increase in payload made possible by the almost weightless atomic fuel, will be sacrificed. Still, the plane will have unlimited range, a big step ahead.

Eventually, perhaps within 20 years, this plane will be followed by atomic jets, ramjets and even rockets. Nuclear reactors will be developed that can pour their vast energy directly into compressors, heating airstreams to such a flame temperature that they will have the thrust of a jet. But not yet. Not enough is known now about reactors at white heat, nor about the ability of air to wipe that heat off instantaneously at jet speed, nor about metals that can stand both the high temperature and the intense radiation.

Until such problems are solved, the reactor used in a plane must operate at relatively low temperature. It will pass its heat to a circulating liquid metal that will in turn pass the heat on to a heat-exchange unit. There a working fluid—mercury or water—will be vaporized to drive a turbine. Then the working fluid will be cooled in a condenser and pumped back to the heat exchanger. All this adds up to plenty of weight.

The reactor itself need not be big. Half an ounce of fissionable uranium (the kind that splits) or plutonium can furnish as much energy as the entire 17,000 gallons of fuel carried by the B-47 Stratojet. Less than a pound would be used up in a 50-hour flight around the globe. But neither fissionable uranium nor plutonium can be used in pure form.

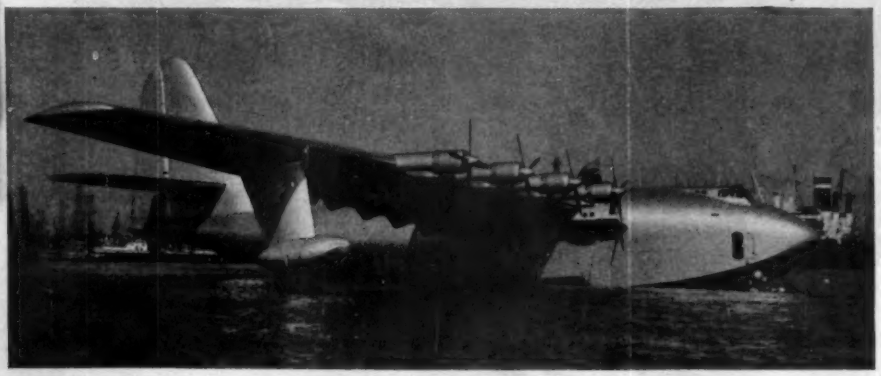
The bulk of the first reactor put into an airplane probably will be ordinary, nonfissionable uranium. This will be enriched with fissionable uranium 235 to permit the chain reaction. Graphite blocks or some other "moderator" will be needed, too, to slow down the fast neutrons and keep the "fire" burning. The generation of power may be controlled by cadmium rods, pulled out of the reactor when power and speed are wanted, pushed in to absorb the neutrons and "bank the fire" for slowed-down flight or landing. So the reactor alone will probably account for several hundred pounds.

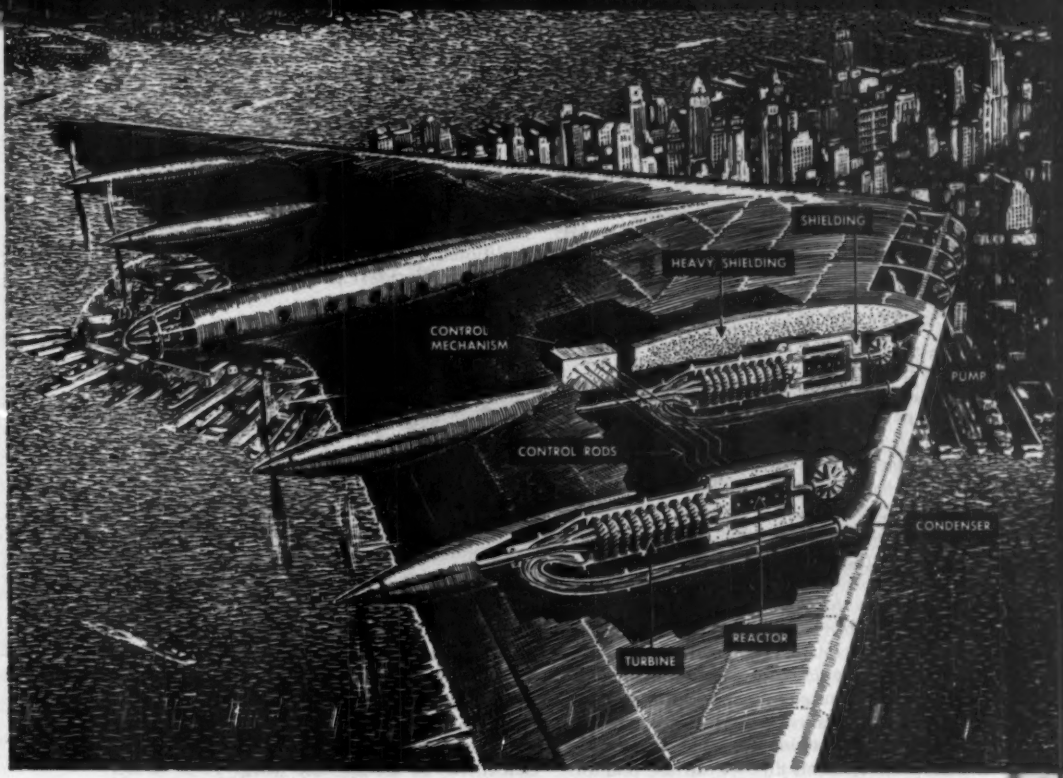
Must Protect Crew

But the reactor only provides the heat. Transmitting the heat to the turbines will involve more equipment—and more weight.

It will not be possible to take the heat

Big flying boat is best bet for first atomic aircraft because of great size and long take-off run needed to lift heavily shielded reactor. It might be similar to world's largest plane, below, Howard Hughes' 219-ft. Hercules, which has four engines in each 160-ft. wing.





Future model could be a flying wing with separate reactor coupled directly to each turbine. Its design awaits development of materials able to withstand high heat and radiation.

from a reactor of the type now in use directly into the working fluid of turbines because of the enormous neutron and gamma-ray activity within the reactor. The working fluid which circulates through the plane to the engines in the wings must be protected from that bombardment or it will become radioactive and endanger the crew. But a heat-transfer fluid can be interposed, probably a low-melting alloy of sodium and potassium. This would circulate through the reactor to pick up the heat and deliver it to a heat exchanger where it, in turn, would heat the actual fluid used to operate the turbines.

Shielding Adds Weight

A reactor and heat exchanger of this type would be "hot" with radiation as well as in temperature, but might not pass the radioactivity on to the working fluid. Still, they would have to be encased in heavy and bulky shielding—probably lead—to stop the radiations from penetrating the plane.

From the heat exchanger in the shielded section, high-pressure vapor lines might carry the steam to six or eight turbines—one for each propeller—mounted in nacelles in the wings.

There the energy of atomic fission would be finally delivered and converted into motion. No shielding would be necessary, but the loss of temperature and pressure through the long lines would be a disadvantage.

This loss can be eliminated only when it becomes possible to provide each turbine with its own reactor, mounted alongside it in the wing.

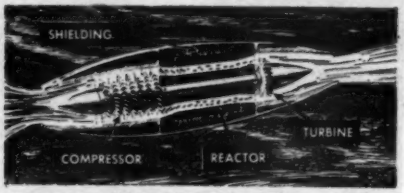
Atomic Warm-Up Takes Time

There also are other problems. The molten metal used as the primary heat-exchange liquid would solidify as it cooled when the reactor was shut down. The first step in bringing the plane to life would be to liquefy the metal with auxiliary heat, probably from a small gas turbine. Furthermore the metal would not be allowed to solidify throughout the system, but would have to be drained from the reactor, the heat exchanger and piping. In fact, the whole system would have to be purged of the liquid

metal, probably with hot helium gas (which does not react even with the molten alloy of sodium and potassium).

System Requires Automatic Control

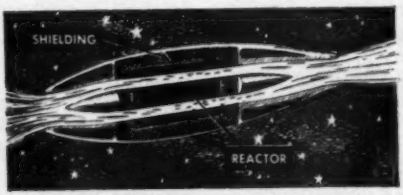
Obviously such a power system would be sensitive and complicated to operate. It could not be done by hand. The energy level of the nuclear reactor would depend on the position of the cadmium control rods. They would have to be precisely adjusted for every phase of take-off, flight and landing. The engines might be sluggish in their response to controls, for a change in the neutron release would first be converted to temperature in the reactor and, with so massive a power system, it would take quite a bit of time to translate that temperature into pressure on the turbines.



Atomic turbojet: Reactor replaces combustion chamber to heat air from compressor.

Automatic control by instruments that know what is going on within the heavily shielded power system would probably be used. Servomechanisms might be connected to electronic instruments that constantly measure the neutron flux within the reactor.

The delay in reaching full power would be a handicap on the take-off, when maximum power is most needed, and the plane would require a long runway—long enough, perhaps, to indicate a flying boat for the first experimental model. Booster rockets would help, but the take-off distance would still be great.



Atomic ramjet: Reactor heats stream of air compressed by plane's forward speed.

Once the great plane is airborne, however, it should operate smoothly and quietly at the highest speeds propellers can bite out of the air. And it should stay aloft for days.

First Flight Possible by 1960

Such a plane could be in operation by 1960. Since 1945 the NEPA Division (Nuclear Energy for the Propulsion of Aircraft) of the Fairchild Engine and Airplane Corporation has been at work on it under contract with the Air Force. Last February the Atomic Energy Commission announced that Fairchild had "completed its contract." This presumably meant that the feasibility of a nuclear airplane engine had been demonstrated.

Since then General Electric has said that its jet center at Lockland, Ohio, has started on an Air Force-AEC project for the "further development of an atom-powered engine for airplanes." The Air Force has made additional space available to the project in the huge World War II piston-engine plant at Lockland.

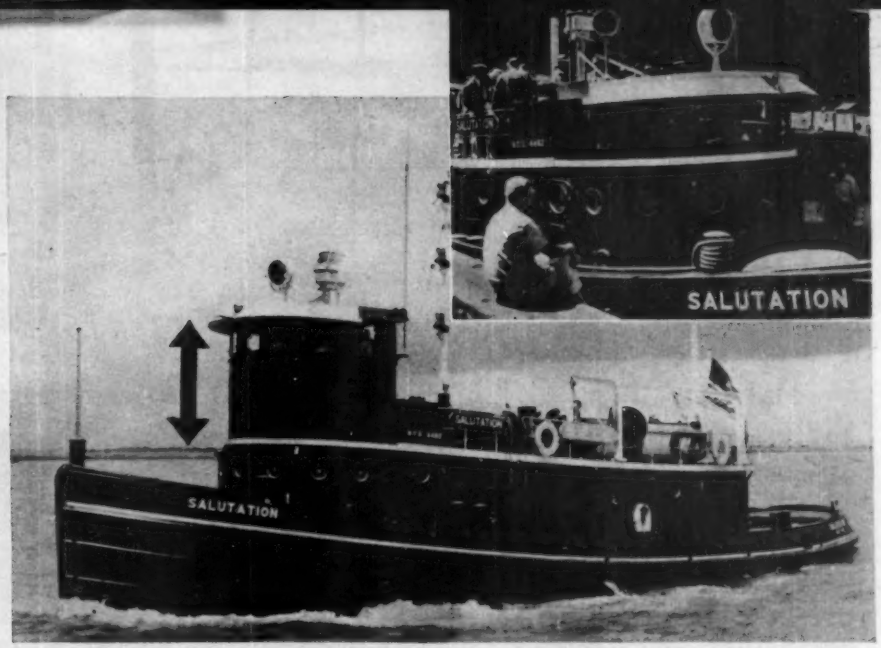
And this fall the Air Force awarded the contract for actual development of the atom plane to Consolidated Vultee Aircraft Corp., the firm that builds the giant B-36. The statement gave no other details. These official announcements can only mean that such a plane is very close to reality.

Actually, this pioneer plane will soon be obsolete. With reactor research work getting into full swing at Arco, Idaho, and at The Knolls at Schenectady, N. Y., it should soon be possible to use a "fast reactor" in place of the slow-neutron model. This may be so much smaller that it can be set into the wing.

Atomic Jets Forecast for 1980

Whether the heat exchanger and the enclosed system of circulating molten metal can be eliminated depends on many unknown factors. But certainly the objective will be to heat air directly in the reactor. Ideally the hot reactor would merely replace the flame in the airstream of a turbojet, with its heat providing the temperature and expansion to give the airstream the direct thrust needed for propulsion. This method of using atomic power in planes might come by 1980.

When it does, the nuclear engine should weigh but little more than present engines. Then, most of the tonnage saved by omitting gas tanks and gasoline can be used for payload. Doubling or tripling the payload will cut the cost per pound of air transportation to one-half or one-third of present costs of operation. And the new era in aviation will be here. END

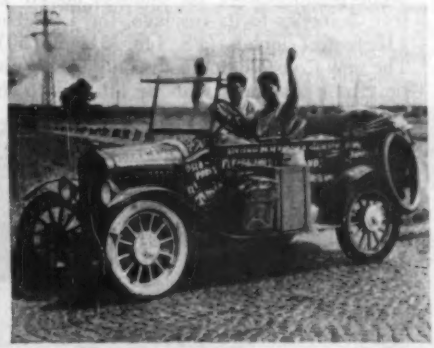


Tug Ducks Under Bridges

Low bridges don't bother this new tugboat—it just pulls in its pilot house. When approaching a span that's too low, the helmsman pulls a lever, and a pneumatically controlled hydraulic lift lowers the pilot house to deck level, as shown in inset. At the same time, the two masts fold over on hinges. After passing under, up come the pilot house and masts again. The 89-foot, 12,000-hp., General Motors Diesel vessel, designed for inland waterways, was built for the Blue Line of N. Y., by the Levingston Shipyard, of Orange, Texas.

Moving Prism Focuses 'Scope

THE Bausch and Lomb 60-mm. target-spotting telescope above uses a new method of focusing in which the instrument's prism moves, instead of the eye lenses. The focusing knob (arrow) is located for easy operation with the index finger. Greater speed and accuracy of focusing is said to result. Weighing 48 ounces, the new scope is available in four magnifications: 15, 20, 30, 60.



Model T Rolls on Straw

UNABLE to buy replacements for the worn-out inner tubes in the tires of their Model T Ford, these two Norwegian students came up with an ingenious solution: They threw away the tubes—and stuffed the casings with straw. How well it works is shown in this picture of them touring Western Germany on their way home from the Paris 2,000th anniversary celebration.

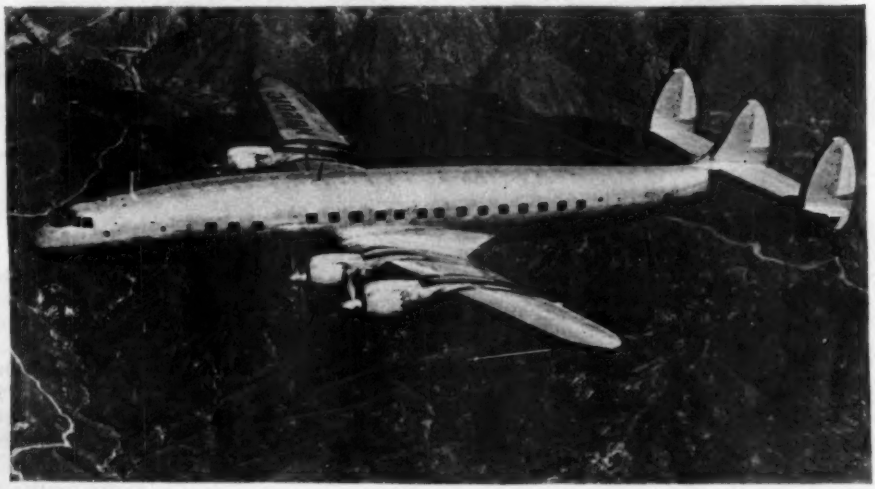
TV Keeps an Eye on Smoke

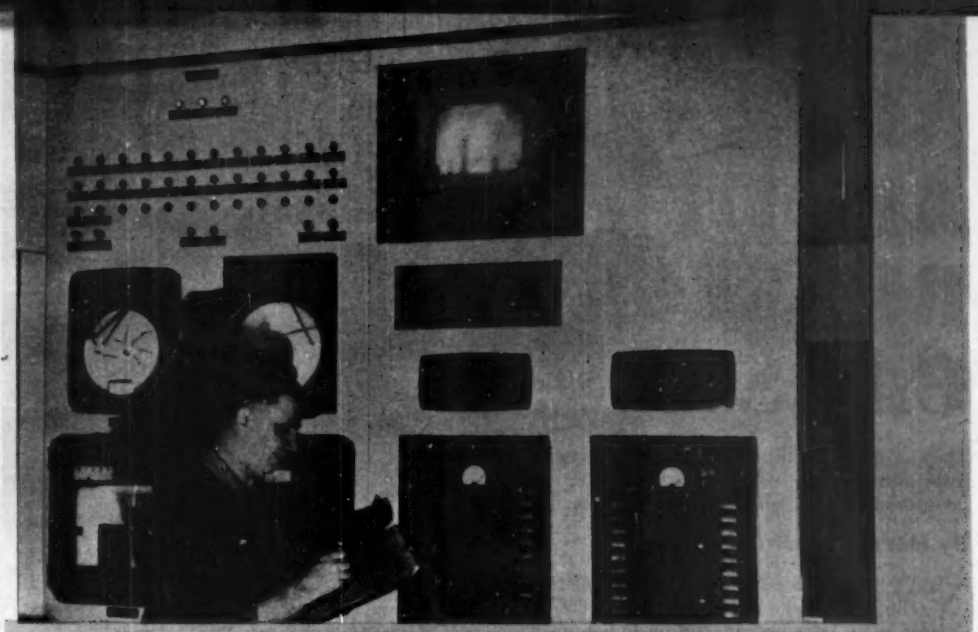
TELEVISION is helping New York cut down its smoke nuisance. Three huge stacks of the Consolidated Edison Company's Waterside generating station, located near the heart of metropolitan New York, can belch a lot of smoke if the boilers are not regulated properly. To keep their sooty output under control, the stacks are constantly televised. In the boiler control room deep underground, an operator watches a video viewing screen and makes adjustments as the picture calls his attention to any abnormal smoke conditions. The company also uses its own television setup to monitor the water level in drums located 90 feet above the control room. In this case, the televised image is a water gauge.

TV camera (at window in background) and monitor are in building four blocks from stacks.

400-M.P.H. Super Connie Tries Its Wings

STRETCHING its 123-foot wingspread over Southern California mountains, the new Lockheed Super Connie is shown in its first flight photo below. Its builders added 18 feet, 5 inches to its fuselage, for a total of 113 feet, 7 inches (PS, Jan. '51, p. 150). The new Constellation is the only U.S. transport built so that it can be fitted with increasingly powerful engines, from the latest reciprocating types to gas turbines driving propellers. Passenger version can accommodate from 47 to 93 persons, depending on seating plan; military type will seat up to 110. Added strength has been built into the new transport plane to take turboprop speeds in excess of 400 m.p.h.

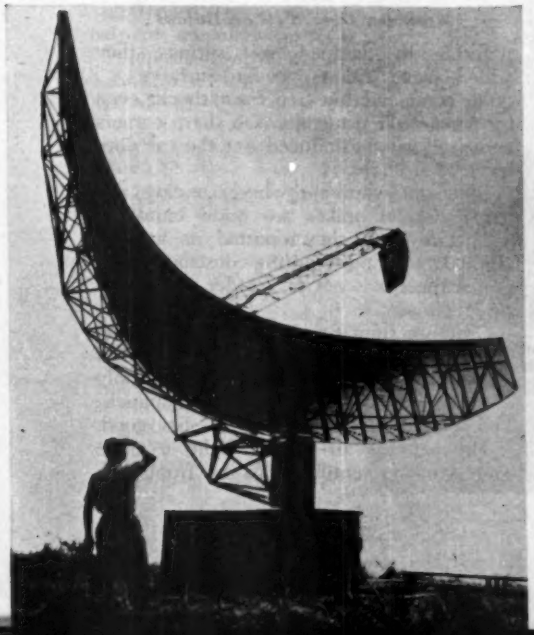




Viewing screen, connected to camera by coaxial cable, is located in boiler room 450 feet below top of stacks. By watching smoke output, operator can adjust boiler.

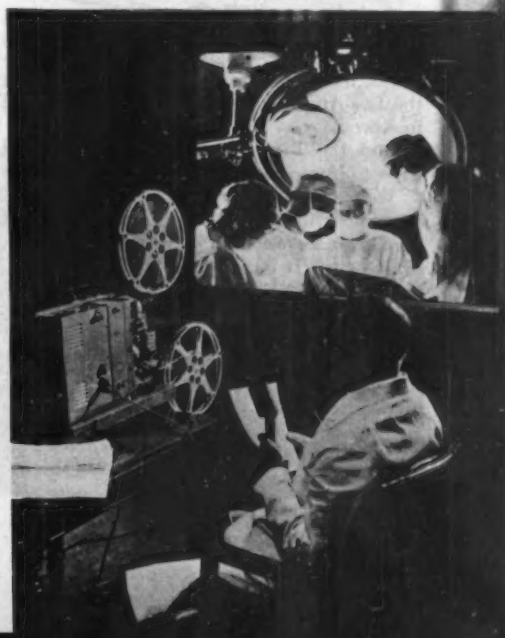
Radar to Scan French Harbor

THIS 40-foot-wide antenna is part of a U. S.-built radar system for the Port of Le Havre, France. Even in a 90-m.p.h. wind, it will make eight revolutions a minute, detecting any object of consequence in the harbor. When tested in Boston recently, scope operators picked up a 10-inch lobster-pot float that was two miles away.

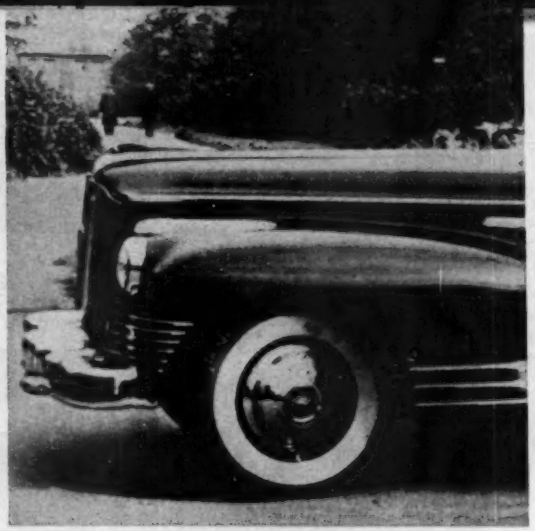


Projector Records Sound, Too

THE new 16-mm. movie projector below can record sound on film as it projects it. With this setup, a running commentary can be added to a movie—as this doctor, describing an operation, is doing—that was originally shot without sound. Made by RCA, the apparatus records sound magnetically on a strip at the film's edge.



ALL ABOUT RUSSIAN CARS



They're hard to come by—and when Ivan gets one he faces many of the same problems Dad did with his Locomobile.

By Hartley E. Howe

NEXT time a foreign-car hot-shot starts telling you about the new Javelin Jupiter or how many kilos he knocked off in a Lancia, just ask him what he thinks of the Pobeda (pronounced po-bee-yeh-da). Or how about the riding qualities of the Zim?

You've got him—unless he's been peeking behind the Iron Curtain—because these are Russian cars. This advertisement ran in *The New York Times* for nine days without bringing a single Russian car to light:

IMPORTED MOTOR CARS WANTED

RUSSIAN AUTOMOBILE wanted for rent or purchase. Must have been built in U. S. S. R. since 1949; now be available in North America. Z6816 Times

But next month, one will be exhibited at the Los Angeles Motorama. It was captured in Korea.

And the Russians recently have started exporting cars to some countries—apparently to secure foreign exchange.

One of the few Russian cars to be allowed abroad is the Moskvich, which means Son of Moscow. It is an adopted son, however, for the Moskvich is almost identical with the German Opel Cadet of 1939. And so it should be: Opel machinery was shipped from Germany to Moscow as war reparations. Russian autos in general are about nine years behind their Western equivalents—a lag partly due to World War II and partly to the problems faced by the Soviet auto industry.

COMMISSAR'S CAR

The Moskvich, a four-seater, has a 102-inch wheelbase and is between a Crosley and a Willys in size. Two reporters from the British magazine *Motor* took a Moskvich four-door sedan out on a test spin. They reported that: "a modern single dry-plate clutch gives a naturally smooth getaway. Acceleration with a three-up load was adequate but not exciting on the partially run-in car we drove . . . The gears are all quiet, including reverse, middle ratio being useful up to 30 m.p.h. and allowing almost 40 m.p.h. to be attained . . ."

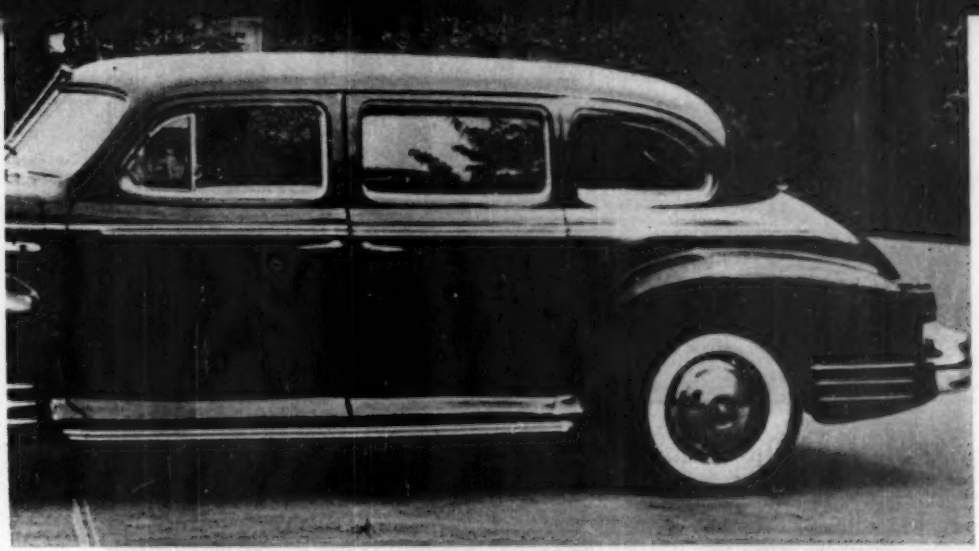
Moskvich Does Well on Bumps

Its lightly damped, soft springs, they added, make "riding over bad surfaces . . . quite commendably free from shock, even for a rear-seat passenger. On sharp corners body roll can be induced but the car does not feel unstable."

Both the worm-and-wheel steering and the hydraulic brakes are quite unusually lacking in "feel," they reported, its "reasonably taut steering requiring conscious attention if the car is not to wander slightly on straight roads."

Criticism from Russian buyers about the quality of the Moskvich has been reported from Moscow, but *Motor* was critical only of the roughness of some of the body panels. The paint job was said to be good.

The car has an interior light, a glove compartment, ventilators in the front win-



Zis-110 is for big shots only. Name stands for Zavod [plant] Imeni [named after] Stalin. L-head engine turns out 140 hp. at 3,600 r.p.m., 20 hp. less than that of 1940 Packard from which it was copied. Maximum speed is 87 m.p.h.; mileage, 10.1 to the gallon.

dows, and dual windshield wipers driven from the engine. The instrument panel includes a fuel gauge, an oil-pressure gauge, a speedometer registering up to 120 km. an hour (about 75 m.p.h.) and a total-distance recorder. The luggage compartment is reached by pulling forward the back of the rear seat.

Distribution Center in Belgium

In Brussels, a major distribution center for Russian auto exports, the Moskvich costs roughly $980. A de luxe model costs about $200 more. These prices, say European auto experts, are below cost.

Reports from South America say Russia plans to sell the Moskvich there for even less—$840. U. S. cars sell there for twice their home price, so the Moskvich would cost half as much as our cheapest midget in South America; one-fourth the cheapest U. S. full-size car.

Other Russian passenger automobiles are the Pobeda, the Zim, and the Zis-110. Smallest is the five-seater Pobeda [Victory] that looks something like an early postwar Chevrolet. The engine is an adaptation of the Continental F4140, which appeared in this country in 1938. The transmission is a modification of the 1932 Ford B.

To improve durability and maintenance, both poor on prewar cars, the Pobeda uses cylinder liners and exhaust-valve inserts. The car also has forced crankcase ventilation, force-splash lubrication and a conventional by-pass oil-filter system. The

NEWEST MODEL

Zim—or "works named after Molotov"—is latest USSR car, aims to provide luxury at lower cost than Zis. Six-cylinder engine is rated at 95 hp. at 3,600 r.p.m., provides a top speed of about 80 m.p.h., gets about 12.5 miles to the gallon. Windshield wipers are electric. It's equipped with radio and heater. The Zim is manufactured at the Molotov plant in Gorki.

FAMILY CAR

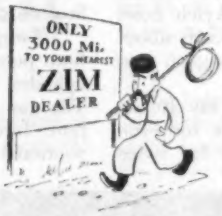
Pobeda [Victory] comes as five-passenger sedan or cabriolet. Four-cylinder engine develops 50 hp. at 3,600 r.p.m., provides 68-m.p.h. top speed, gets 19.5-23 miles to the gallon. Car weighs 2,926 lb., has a 106-inch wheelbase. Its heater is important item in Russian winter.

wheels are suspended independently; brakes are hydraulic.

The next larger Russian car, closely resembling a Buick in appearance, is also the newest, the six-passenger Zim. It is described by the Russians themselves as fast, highly maneuverable and with good road qualities. Other characteristics include independent front-wheel suspension with helical springs, and fluid drive.

Russian Zis Resembles Packard

The fourth Soviet passenger auto, the biggest, is available only to top-drawer commissars. Called the Zis-110, it is an adaptation of the Packard Custom Super Eight 1808, the 1940 model, but minimum tolerances are reported to be .002 to .004 inches, noticeably larger than the Packard's. It carries seven passengers, and also comes as a touring car. The windows have push-button controls.



How much does a Russian pay for one of these cars? Well, he probably can't buy the Zis at all; the only way he can get one is to rise in the Soviet bureaucracy until he reaches a job with a Zis built in. In 1949, the Moskvich was advertised in Russia for 9,000 rubles and the Pobeda for 16,000. More recent reports quote the Moskvich at 8,000 and the Pobeda at 12,000. Figuring the buying power of the ruble in Russia at five cents, the last-mentioned prices would be $400 and $600. Using the Soviet's official exchange rate, 25 cents, however, they would be $2,000 and $3,000. The average monthly pay of a Soviet worker is only 620 rubles, so that it would take him 13 months' work to earn the cheapest car. However, skilled workers sometimes make five times the average rate.

American experts feel the cars are priced low in relation to other Russian luxuries—less than six times as much as a good suit, for example. Coupled with the tiny production rate, this makes them suspect that the sales price is arbitrary and that the cars are really used as rewards.

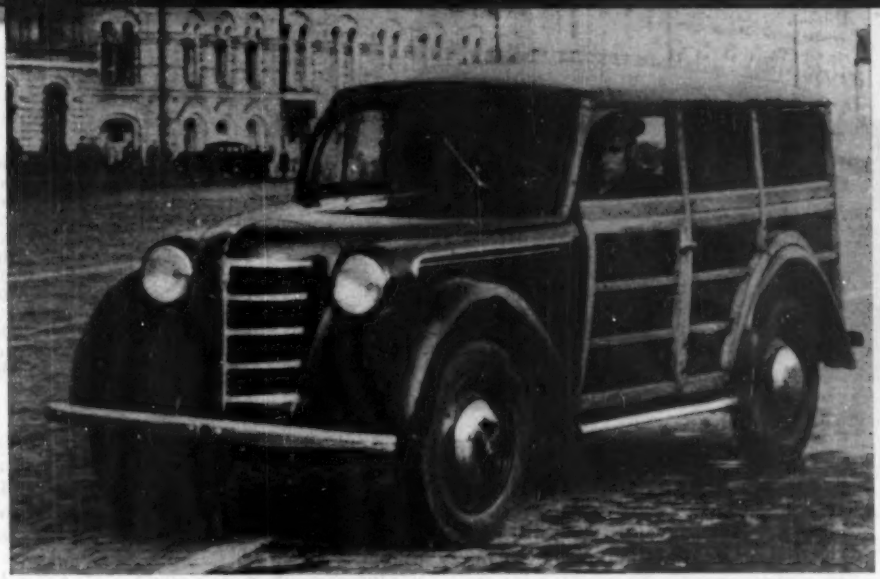
The cars are sold for cash, and it isn't easy to save up the money—all savings were sharply cut in 1947 by currency manipulation. Nevertheless no glut seems likely.

The 1950 production goal under the Third Five Year Plan was 72,000 units. We don't know if they made it, but one Soviet report gives 1950 production as 141 percent of 1949, which would make 1950 only 28,200 cars. That year the United States made 6,672,700 passenger cars. The Soviet planned to make six times as many trucks as autos, however, while here we made five times as many cars as trucks.

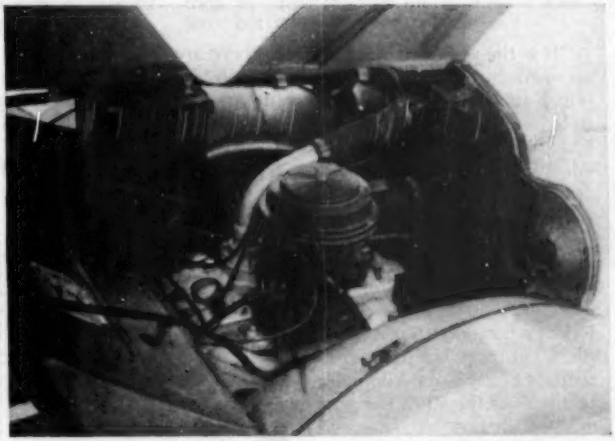
Only a Few Sales Agencies

There are reported to be 16 retail auto-sales agencies in the USSR—a tiny number for such a huge country. City department stores take orders, but from Russian accounts many people travel long distances to Moscow to order an automobile at one of the beautifully decorated marble showrooms. A Moscow salesgirl, Miss Suslina, reported that her store sold 15 to 18 cars a day, and a total of more than 7,200 to individuals in the "past two years and more." That's a big chunk of the entire Russian output for that period.

After a Soviet citizen successfully saves his money, gets the nod from the party boss, finds a salesroom and proudly drives away in his new car, he finds that his problems have only begun. He's likely to have the



MIDGET



Moskvich station wagon, above, is very popular in Russia. Car also comes as four-door sedan. Four cylinder engine, right, turns out 24 hp. at 3,400 r.p.m. to provide 45 m.p.h. cruising speed, 56 maximum. Fuel consumption is reported 30 miles to the gallon. Unsynchronized shift provides three speeds forward, plus reverse; gearshift lever and hand brake are on the floor in center. In picture at right, battery is at top left; downdraft carburetor is at the right of the engine.

same troubles now that your Dad did when he bought his first Locomobile.

For one thing, autos are still so rare that there is little chance to learn to drive. As one man wrote to *Pravda:* "The need to issue detailed illustrated handbooks which are comprehensively written is perfectly obvious. However, the car factories supply owners with too-brief instructions."

The same letter went on:

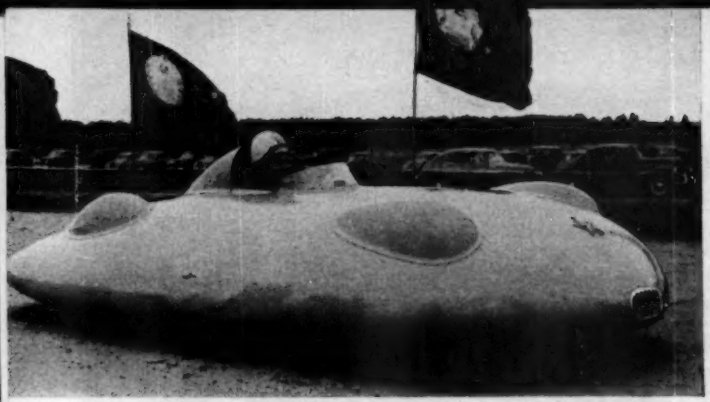
"Owners of private vehicles have not the opportunity of obtaining the spare parts for them. The supply of car parts by post has not been organized. Cases in which because of defective spark plugs, wear and tear on the piston rings, condenser leaks, and other minor defects, owners are deprived of the opportunity of using their cars and motorcycles are not infrequent."

Then comes a most revealing complaint: "It is not easy to buy petrol and oil. Thus because of the lack of petrol and oil my Moskvich is off the road."

Repairs Are a Problem

The repair problem is really tough. An article in *Izvestia* this past winter noted that despite the increased number of car owners "nothing is being done in the district for the servicing of private cars.

"In a city as big as Stalino the repair of motor tyres is a complex problem. Before



RACING CAR

Svezda [Star] is Soviet sports racer. This is Model III, shown with "Master of Sports" Pavel Baranov at the wheel. According to the Moscow radio in 1949, the racer weighs 900 pounds, goes 102 m.p.h. Its engine is rated at 54 horsepower. The car is made from parts of the Moskvich and the M-72 motorcycle.

last summer there was a public vulcanization workshop in one of the artels [producers' cooperatives]. Now it is closed. Car and motorcycle owners are compelled to make private arrangements for tyre repairs with workers in garages where there is vulcanization equipment.

No Service Stations

"It is the same with car repairs. There are no workshops in any of the towns in the oblast [region] prepared to accept cars . . . from citizens for repairs." Service stations have been suggested for two years, the writer adds, but there still isn't a one.

Once you've learned to drive and maintain your car in Russia, found a garage, a mechanic, and a man to fix flats in his spare time, and discovered a place to buy gasoline, you face the problem of where to drive. There's plenty of room but few paved roads. On an 8,000-kilometer test run of the Zim, the cars crossed shallow streams and roads flooded after heavy rains. The Zims averaged 36 to 42 m.p.h. over asphalt roads and only 24 m.p.h. on mountain roads. It's not surprising that soft springing is emphasized on all Soviet passenger autos.

Comparatively primitive conditions turn up repeatedly in the whole picture of motor transport in Russia. In Soviet auto factories production is inefficient with high overhead and low output per worker. In 1947 casting rejects ran as high as one out of every four or five. Tires frequently last only 1,000 miles: while some may go as far as 9,000, others last only 90!

Short vehicle life and high operating costs reflect this situation. In 1937 only 55 to 60 percent of the motor vehicles in the Soviet Union were in running condition at any one time, and things were reported no better in 1948. In 1947, it is estimated, it took one man 200 days' work to keep one truck running for a year.

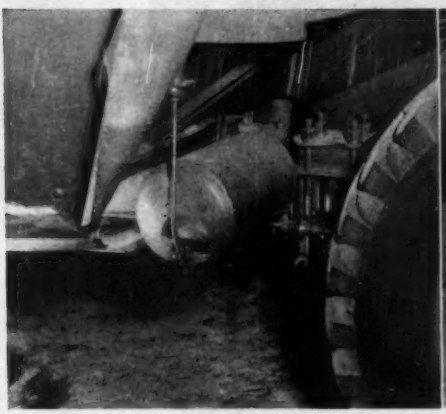
Poor manufacturing quality isn't the only cause of these troubles—Lend-Lease trucks wore out quickly in Russia too. Bad roads and a terrific climate are partly to blame, but inadequate maintenance and poor quality gasoline and lubricants are a major cause. The Russians are struggling to overcome these handicaps. The new cars are designed for longer life with such features as winter preheating devices, removable main bearings, and fuel, air and oil filters. Preventative maintenance is being taught. Gasoline and lubricants are improving, although standards are still low. Difficulties in making good gasoline have led to considerable research into engines burning natural gas or liquefied butane—propane.

Raising factory standards is a herculean job. A returned German prisoner of war who worked in the Moskvich factory reported that "all around the machines waste is heaped, and . . . it has been left there for several days . . . The worker's mind and sense of duty are not quite as organized as you might be used to from Western plants.

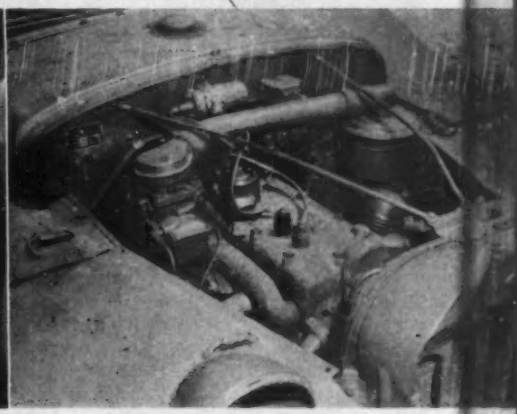
Presses Overloaded

"The presses that shaped the enormous sheet-metal squares into fenders . . . and other parts one day may be so overloaded that the material piles up in veritable mountains, making it impossible even to look from one station to another. A

"JEEP" Russian-made jeep, captured in Korea, is one of two USSR passenger vehicles found in this country. It resembles U. S. jeep (right, above) in general appearance, but is more crudely made. Most of body can be shaped with simple hand tools, then roughly welded. Ribbing for strength, found all over U. S. jeep, is kept at minimum to avoid press work. Soviet car is unreliable and less agile —ask Pfc. E. W. Street, shown at wheel. When he was cut off by a road block during ill-fated retreat from Taejon in summer of '50, Street tried to break through in abandoned enemy jeep, but it quit on him repeatedly.



Exhaust receiver with baffle, just behind right front wheel, is typical of simplified equipment used on Russian jeep. It allows the exhaust gases to expand and muffles them slightly.



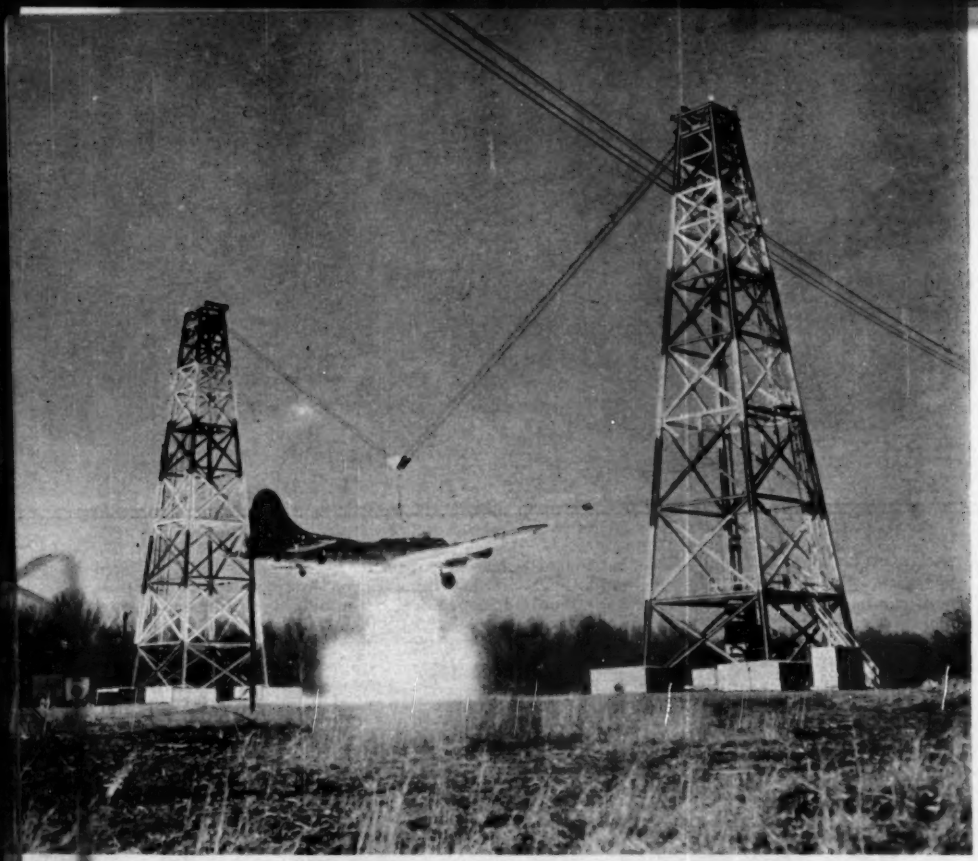
Engine in Russian jeep is similar to Fordson tractor engine, but distributor is like Mallory. It has a fuel pump. Gears are non-hypoid; front and rear axles resemble Ford Model A.

'norm' is on the way. The waste is hurriedly pushed over to any open space . . .the next day workers are very busy carting away the dirt. It would be impossible to go on producing for nobody can move . . . This means that the management or the foremen must possess the gift of improvising more than in any other country . . .

"Here you have to think in the Russian way: 'Nitschevo, we will muddle through, Daddy State pays for all'."

[*Continued on page 302*]

Valve under dash enables driver to change from gas tank in the cowl to second tank under his seat. Note easily serviced gas filter at right. Instruments, upper left, are like Model A's.



War-Weary Planes Wind Up as Sitting-Duck Targets

THE B-17 Flying Fortress above is giving its last performance as it "flies" through an antiaircraft barrage simulated by machine-gun fire and explosive charges fired under controlled conditions. The purpose of this unique shooting gallery at the Aberdeen Proving Ground in Maryland is to study the effect of battle damage on fighting planes under controlled conditions. Planes, from 40-ton bombers to fighters, all war-weary veterans on their way to the scrap heap, are hooked onto a steel cable between two 125-foot towers and raised to the desired height by an electric winch. They also can be suspended by the tail or nose to simulate various flight conditions.

Fork Lift Speeds Bridge Building

THE British army has borrowed the factory fork lift to build bridges. Designed to aid in erecting the famous Bailey bridges that helped transport Allied troops across Europe this one (left) easily handles a 2,800-pound bridge section. Maximum load is two tons.

New Streamlined Steel Plant to Be World's Most Modern

By George H. Waltz Jr.

AS YOU read this, 8,000 construction workers are racing to complete a steel plant that will better our steel stockpile for military and civilian needs by almost 2,000,000 tons of [illegible] a year. When [illegible] in 1952, it will be the [illegible] most [illegible] and shorts and [illegible] and cheapest [illegible]

Artist's drawing shows how 3,800-acre Fairless Works of U. S. Steel, near Morrisville,

will be capable of producing 3,000 tons of pig iron a day. They will feed the plant's nine big open-hearth furnaces with enough iron to turn out 1,800,000 tons of steel ingots a year. That's enough steel to build annually a *total* of:

- 10 aircraft carriers,
- 2 heavy cruisers,
- 500 airplanes,
- 500 army tanks,
- 500,000 three-inch shells,
- 10,000 freight cars,
- 300,000 automobiles,
- 574,000 household refrigerators!

Once the plant swings into full operation, the steel will flow in production-line fashion from the ore-storage yard at one end to the freight yards at the other. The raw mate-

Pa., will look when construction is completed next year. It will be world's most modern.

rials—enough iron ore, limestone and coal every year to fill a train of railroad hopper cars 1,250 miles long—will arrive via the Delaware River.

The ore and limestone will be stockpiled in a giant ore yard. The coal will ride a mile-long conveyor to two batteries of coking ovens. Each battery will consist of 87 ovens, and the two batteries will produce 1,000,000 tons of coke a year. These ovens also will produce important tonnages of such coal chemicals as phenol, light oils, ammonium sulfate, crude naphthalene and tar, as well as coke-oven gas for use as fuel elsewhere in the mill.

The two blast furnaces will convert the iron ore, coke and limestone into a continuous flow of pig iron to feed the big mouths

of nine open-hearth furnaces which will turn the iron into various types of steel. Enough bricks to build 1,100 six-room homes are being used for this battery of furnaces, which will be the world's largest.

From the furnaces, the steel ingots, weighing five to 25 tons, will be moved by rail to the plant's longest building—it will stretch along for more than a mile. There, the ingots will be stripped from their molds, reheated in soaking pits, and then sent through rolling mills to be transformed into various types of steel stock. Each main electric driving motor on these mills will produce as much power as a locomotive hauling a streamlined train.

Steel Mills Are Thirsty

In full operation, the Fairless Works will require as much electric power as a city of 450,000, such as Newark, N. J., Kansas City, Mo., or Seattle, Wash. For fuel, in addition to coke-oven gas, it will use about 9,000,000,000 cubic feet of natural gas—enough to heat half the homes in Philadelphia—and approximately 42,000,000 gallons of fuel oil every year.

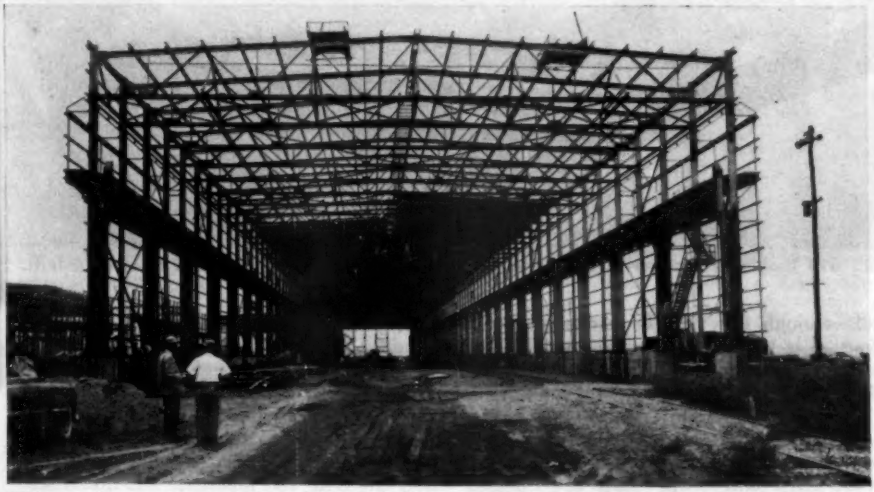
All steel plants are heavy water users—it takes about 150 tons of water to produce a ton of finished steel—and the Fairless Works will be no exception. About 230,000,000 gallons a day will circulate through the plant for cooling and cleaning. Some will be pumped in from the Delaware River and some will come from wells. More will be put back into the river than is removed, and it will be cleaner than the water drawn from the river.

Soot Will Be Trapped

The bellowing clouds of black smoke and gritty soot that most people associate with a steel mill won't be visible at the Fairless Works. The blast furnaces will have dust catchers and electric precipitators to remove any fine ore particles that might otherwise escape. The trapped furnace gases then will be cleaned and used to heat the tall cylindrical furnace stoves that heat the air for the blast.

The coke ovens will be of a type that traps the smoke and gases generated during the coking process, and special equipment installed in the open-hearth shops will prevent dust from entering the furnace stacks. In addition, all locomotives used on the plant's 70-mile standard-gauge railroad will be Diesel-powered.

The Fairless Works is the largest single element in a defense program that eventually will add more than 4,000,000 tons a year to the capacity of U. S. Steel's facilities. It will be a major factor in the effort to boost the 1950 production figure of 97,000,000 tons of steel ingots to 118,000,000 tons by the end of 1952. That will be just about three and one-half times what Russia and her satellites were able to produce last year.



This steel-storage warehouse skeleton looks big, but is short compared to a mile-long extension that will house rolling mills and soaking pits to heat ingots.

When high-speed, jet-propelled seaplanes are built, they probably will look like this model.

Supersonic Seaplanes Are on the Way

IN A preview of seaplanes that may fly faster than the speed of sound, sleek little models, powered by four miniature jet engines, are taking off from the choppy waters off San Diego bay. Controlled by radio from the ground, they streak along at a scale speed of 632 m.p.h.

The first full-scale version of the Skate, so called because its shape resembles a fish of that name, probably will be a twin-jet, water-based Navy night fighter. Flight tests with models indicate that it will be able to take off in 15 seconds; fly about as fast as present jet interceptors; plane through seas with 12-foot waves; land in seas that would swamp today's seaplanes.

Flying boats have always suffered the speed disadvantage of a cumbersome hull that had to be deep, not only to buoy up the plane in the water, but to provide clearance for the propellers. Switching from props to jet propulsion, a young engineer with the Consolidated Vultee Aircraft Corp., Ernest G. Stout, set out to design a seaplane so aerodynamically clean that its speed in flight would be limited only by the power of its engines.

To achieve his goal, Stout devised the blended hull-wing—in effect, a flying hull. When the engines roar, all areas of his Skate, from tip to tip, from stem to stern, exert lift. The sweeping lines of his hull, however, didn't lend themselves to an easy breakaway from the water. So he put a 45-degree retractable step under the hull to lessen the drag of water on take-off.

Ernest Stout shows off blended hull-wing of 1/13-scale model of his Skate Seven. Full-size version will have 75-foot wingspan, be 62½ feet long, stand only nine feet high.

Another flying-boat problem he had to lick was spray. This he did by installing narrow metal strips sloping downward from the hull. Acting as dams, they deflect the spray down, robbing it of its bounce and force. The spray dams are also retractable.

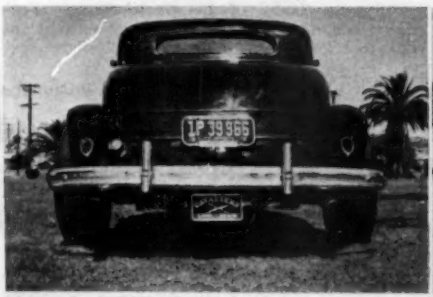
Skate Seven, shown at the top of the page, isn't the final development. Versions eight and nine are flying secretly—and one may be a supersonic model. If not, Stout has plans for a delta-wing seaplane. END

Father and Son Build Hot Rod

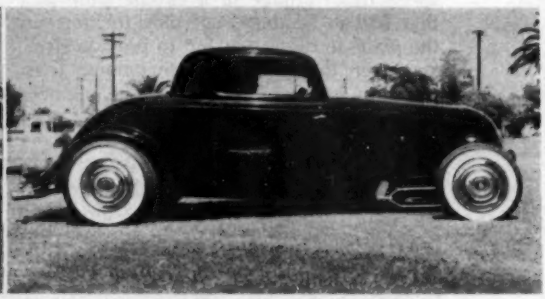
YOUNG Monte Trone, Long Beach, Calif., high-school student, wanted a fast coupe of his own—but bad. He decided to build it himself after school hours and with his dad's help. Three years later the job was done—a sporty hybrid that's clipped a neat 123 m.p.h. in supervised time trials on dry-lake speed courses.

A 1933 Ford chassis was the starting point. Monte installed a racing-car nose and hand-formed the rear fenders to their new contour, adding a ¼" welding bead for reinforcement. Then he redesigned the hood panels and altered the cowl to fit. A lowered front axle makes the car slope down.

Supplying power is a souped-up 59A Mercury block. And as befits a proud craftsman, Monte put his signature on the job by welding monogram initials on the front nerfing bar.

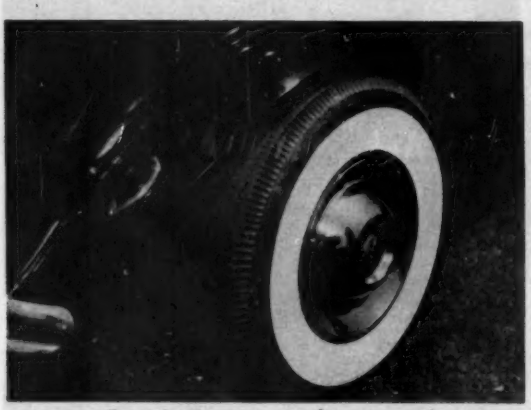


Tail plate of reworked Ford coupe shows Monte is a member of the Cavaliers, a Southern California group of car-building enthusiasts who also are leaders in a safe-driving campaign.



Chromed front axle was lowered three inches, producing a sleek, nose-down look. The top of the coupe barely reaches the young builder's shoulders. Car is finished in jet black.

Mercury block was rebored .060 inch, stroked ¼ inch, ported, relieved and electronically balanced. The battery box and headers were homemade. Engine has 265 cu.-in. displacement.



Rear fenders were partly cut away for appearance. Rear wheels were made by welding Ford center sections to Buick outer rims. Combination eliminates side roll, says Monte.

Dash panel and instruments came from a 1932 Packard Custom, one of only a dozen that were built. New gauge added in center is an r.p.m. counter for acceleration tests and time trials.

Mine Detector Spots Nails

THE worker above doesn't expect to find an explosive mine in the log he is checking. But the war-surplus detector will warn him of hidden nails and bits of metal that could wreck equipment in the sawmill of the Monon Lumber Co., New Albany, Ind. The metal can then be removed before it does any damage.

Jets Show Afterburners

STREAMS of fire against a dark sky spurt from the tails of Lockheed F-94s as they turn on their afterburners for an extra burst of speed and climbing power. Shown starting on a night training mission over the Pacific, the Air Force all-weather jets are the first planes to place afterburners in operational use.

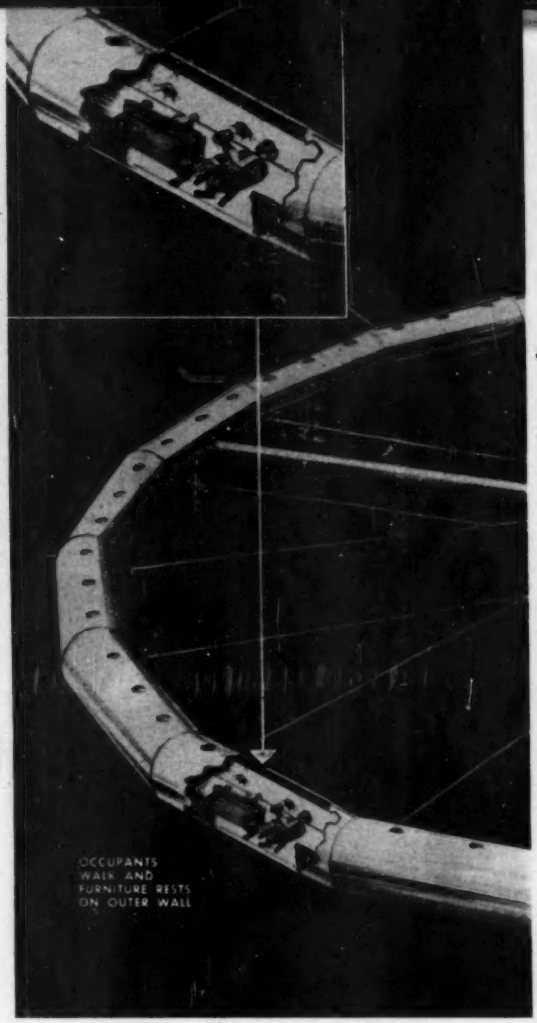
Giant Doughnut Proposed as Space Station

A rocket scientist presents a design for a man-made, man-carrying satellite to circle the earth 1,075 miles up.

INWARD is "up" and outward is "down" in the extraordinary structure pictured here. Dwellers in it would walk on its outermost wall, their heads toward its hub.

The drawing gives a scientific preview of an inhabitable "space platform" floating in the sky at a 1,075-mile altitude and circling the earth as a satellite.

An "artificial moon" such as this could serve as a military base, observatory and rocket-ship refueling station. Its possibilities have been reported under study by the Department of Defense. What it may look like is now revealed by a former German V-2 rocket expert, Dr. Wernher von Braun, of the Ordnance Research and Development Sub-Office, Fort Bliss, Texas. In a book just published by the University of Illinois, *Space Medicine*, he presents his conception of a feasible design.



Will Make Own "Gravity"

His proposed space platform, of 200-foot diameter, resembles a giant doughnut. It rotates slowly on its axis. As if in a submarine, its crew live and work inside its air-conditioned and pressurized rim.

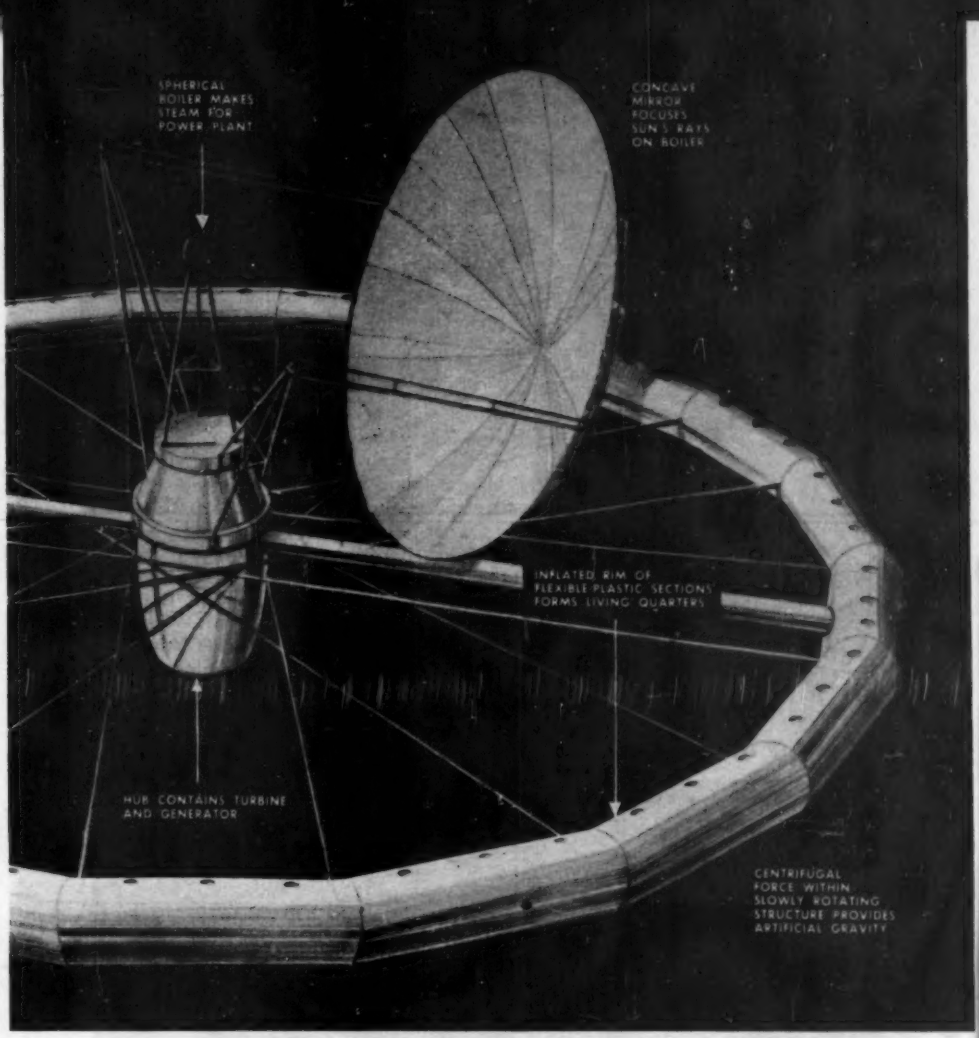
Gravity will be absent. But centrifugal force from the rim's rotation gives occupants a foothold and enables them to walk along the wall. This artificial gravity also averts possible ill effects of prolonged weightlessness upon the human system.

A silvery concave mirror focuses solar rays upon a boiler, making steam to run a turbine and generator for electric power.

By rocket ship, Dr. von Braun proposes, the platform's parts will be carried to its orbit for assembly there. Ten to 20 collapsible sections of flexible plastic, which can be unloaded through small hatches, will form the bulky rim. Men in pressurized space suits will join them and inflate the ring like a tire. Unloaded at an orbital speed offsetting the earth's pull, men and materials will float in space, as will the assembled platform.

But its inhabitants will not be marooned there. Rocket-ship "ferries" plying between the earth and its new satellite will pick up returning personnel and deliver relief crews, provisions and rocket fuel.

Feasibility of the whole idea, of course,



hangs upon developing rocket ships that can erect and serve the space station. Such a ship, Dr. von Braun has calculated, will be a triple-stage rocket of 30-ton payload, about 200 feet long and 65 feet in maximum diameter. In flight it will launch a second, smaller rocket and this one will in turn launch the third and final rocket carrying passengers and cargo. The third-stage rocket will be winged for a gliding landing on its return to earth.

Satellite Could Drop Bombs

Incentives to erect a space platform are urgent, Dr. von Braun points out. An observatory free of atmospheric disturbances, it could have telescopes powerful enough to see people on earth. It would offer weather forecasters and astronomers an ideal view of the earth's cloud formations and the stars. As a way station, it would speed the day of interplanetary travel.

More immediately vital, it would make a non-interceptible bomb carrier, swooping around the earth in two hours at a height beyond reach of present defense weapons. It could launch rocket missiles and guide them accurately by remote control and radar to any spot on earth.

"It appears to me," Dr. von Braun declares, "that in the atomic age the nation which first owns such a bomb-dropping space station might be in a position virtually to control the earth." END

New British Rifle Outfires U.S. Garand

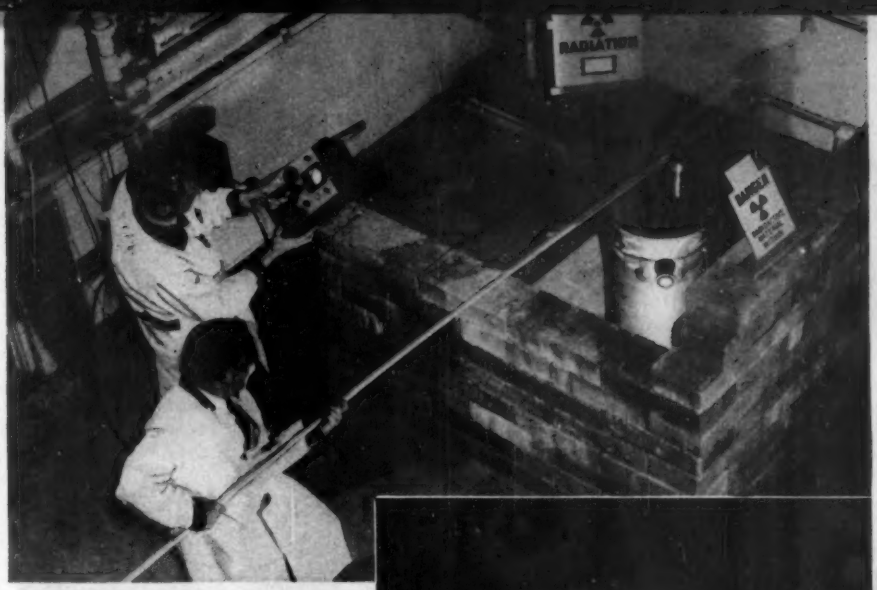
THE place: Westminster, England. The contestants: A new British .280-cal. automatic rifle vs. the U. S. automatic Garand M-1. The score: 84 rounds of fire a minute to 43—in favor of the British .280.

A radical departure in design, the new British weapon, developed by the Army after five years of research, has no wooden stock, is almost a foot shorter and more than a pound lighter than the Garand, and carries 20 rounds of ammunition instead of eight. It has an optical sight in place of the Garand's traditional peep type. While the gun's penetration is slightly less than the heavier Garand, it has only half the kick.

Although the British call it "the best weapon of its kind in existence" and plan to adopt it as the standard infantry arm, the U. S. is not likely to switch rifles.

Luxury Car for Argentina's President Is Air-Conditioned

A REFRIGERATOR unit (arrow), powered off the fan belt, will lower the temperature 15 degrees inside a de luxe, $11,000-Cadillac fancied up for Argentina's President Peron and his wife, Eva. The unit also will ice a built-in bar. Among other gimmicks are: back-seat television, telephones, folding tables and bulletproof glass.



Radium Substitutes Equal World's Supply

ATOMIC-RESEARCH technicians above are uncorking one of two tiny bundles of radioactive energy that will each emit as much gamma radiation as all the radium that existed before World War II. Made of the rare isotopes cobalt 60 and tantalum 182, the new highly powerful radiation sources will make many industrial experiments possible for the first time. Prepared at Brookhaven, they will irradiate test samples submitted by industry, then the samples will be returned for study. They are expected to find early use in research on food preservation and plastics.

Radioactive tantalum under several feet of water in the reactor "canal" emits enough light to take its own picture. Pipe and rope are used to handle isotope.

Rim Saw Rips Big Timber

THIS circular saw blade has no middle—just a toothed rim. A 30-inch band of steel rotating in a light aluminum frame, it will cut through, trees up to 30 inches thick without any central shaft to get in the way or add weight. Driven at the edge by a flexible shaft from a small gasoline engine, it can be held at any angle, even laid flat on the ground for cutting down trees without leaving stumps. The blade rides on three ball-bearing rollers in the frame, and a hook holds it firmly against a log while cutting. The Barker Saw Co., of Springfield, Mo., makes the outfit.

Pillow balloons are being tested for leaks. "Svoboda" is "freedom" in Czech and Russian.

'Freedom' Leaps Iron Curtain

Another type of freedom balloon starts its eastward journey from Munich. Made of rubber, the 24-inch sphere will rise to 25,000 feet, when it will burst and rain its messages.

AN AMERICAN assembly line is turning out "freedom balloons" that are then stuffed with pro-democratic messages and released in West Germany to float with the prevailing winds over the satellite countries behind the Iron Curtain.

The pillow balloons shown above—accused of being the original flying saucers—were developed by General Mills at Minneapolis for upper-air research. Made of .0015-inch polyethylene, they are 54 inches square, and differ from ordinary balloons in that they do not stretch. Thus, with rate of escaping gas known, specific targets can be hit with a high degree of accuracy, making them ideal for the Crusade for Freedom.

Besides being able to carry a quarter of a pound of printed messages inside, their 2,916-square-inch surface makes a good "billboard" for freedom slogans. They also create good will among housewives, who eagerly grab the balloons and use the plastic for wrapping food or as tablecloths.

Wilbur Shaw Reports on

GM's New Engine

It looks like good news for motorists—this experimental 12-to-1 power plant. . . . Plenty of hustle plus more mileage.

By Wilbur Shaw

AT THE General Motors Proving Ground in Milford, Mich., I bent over a black box on the front seat of an automobile. It had two dials on it. Twin needles on one of the dials gave a composite reading of 2,328. Similar twin needles on the other dial gave a reading of 1.58.

The first figure stood for revolutions on a counting wheel attached to the back bumper of the car, the other one for time calibrated in minutes and hundredths.

"There's your answer," commented an engineer beside me.

Without interpretation, the readings on the two dials were only a couple of figures in a mountainous mass of research statistics compiled daily at the proving ground. To the engineers tracking down the inside dope on a new high-compression engine, they were highly significant.

They meant that this experimental engine, with a shortened stroke, a special head and super-octane fuel, could drive a car as big as a Cadillac almost 30 miles at city traffic speeds—on one gallon of gasoline.

If engines with 12-to-1 compressions, like this one, eventually come into general use, motorists will get at least a third more gas

In Detroit, C. L. McCuen, GM's research chief, showed me the new high-compression engine.

The fifth wheel is a standard device for measuring distances traveled on a test track. Fuel burned in the 12-1 car costs GM 35 cents a gallon in bulk, would cost you and me a lot more.

This little box contains exactly 74 cubic centimeters of fuel for a test run. Electrodes cut off the main gas supply to the engine and reopen it when the run has been made.

mileage out of their cars even at 70 miles an hour on the open highway.

They will get the same scat they obtain from today's engines out of smaller engines tomorrow. And smaller engines would mean lighter-weight cars.

That was the reason I went to the proving ground—to get a first-hand feel of a development that promises so much for the future. I came away with some news not only about engine research but also about a new experimental Hydra-Matic transmission.

Before going to the proving ground I visited the Research Laboratories Division of General Motors in Detroit. Here they had another of the high-compression engines on test. I sat in a remoted control room and manipulated the throttle and spark on this engine. All about me were instruments that told how the engine's power output varied with throttle setting and how it reacted to fuels of different octane (anti-knock) ratings.

I manipulated the controls on the high-compression engine being block-tested in the laboratory. The scale you see in the right background registers amount of torque developed.

Testing is the part of the research process that takes the time. Designers immerse themselves in higher mathematics to project the specifications on a new engine. They build it. They plot its probable performance. Then they spend thousands of hours testing it under controlled conditions to see how close they came.

Putting an Engine on the Spot

The proving ground is something else again. Here engines on test are put into automobiles and road-tested under any and all conditions of temperature and humidity. This simulates the kind of treatment that the engines would get if put in the hands of hundreds of thousands of motorists.

The particular engine I came to see was dubbed the "19XX." The "19" stood for the century, the "XX" for a question mark as to the year it would—if ever—reach the salesrooms on America's Automobile Rows.

There were instruments at the proving ground too, but they were portable. They were mounted on or carried in the car equipped with the test engine. The black box that I've mentioned depended on two separate instruments to deliver its readings.

One was the fifth wheel. This is a wire-spoked bicycle-type wheel with a generator attached to it. As the wheel revolves through its free contact with the roadway, it generates electricity. The current is fed by a wire temporarily routed through a rear window of the car to the box on the front seat.

A wheel-revolution counter and a clock, shown here, are indispensable in figuring a car's actual speed. The availability of high-octane fuels is something yet to be determined.

The other instrument you see here, in the hands of the GM engineer who rode with me, tells how far the spark can be advanced on fuels of various octane ratings without getting a knock.

There a galvanometer, an instrument for measuring voltage, calibrates the strength of the current in terms of wheel revolutions.

The fifth wheel supplies one of the pieces of information needed to determine fuel consumption—exactly how far the car travels.

A second item of information needed is how long it takes the car to travel a certain distance. That's supplied by a clock. If the engineers know the distance traveled and the time it took, they know the miles-per-hour. The miles-per-hour figure is important because gasoline consumption changes with speed.

Still missing, of course, is a third piece of intelligence—how much fuel was used to drive the car a given distance at a given speed. That's supplied by a box clamped to the front bumper of the car. In the box is a chemist's burette, a vial, containing exactly 74 cubic centimeters of fuel. A fuel line to the engine is attached to the top of the burette.

Running Out of Gas on Purpose

When a test run is made, water treated with copper sulfate is cut into the car's fuel supply line below the burette. The copper sulfate boosts the water's electrical conductivity. When the water reaches an electrode on the bottom of the burette, it sends an impulse to the black box. This starts the recording mileage meter and the clock. As the fuel flows from the top of the burette and into the engine, the water takes its place. When the water reaches an electrode in the top of the burette, it stops both the instruments. The fuel in the burette has been used up and the engineers start their calculations.

And here are the formulas used by the engineers to get their fuel consumption and the speed of the car:

The miles-per-gallon equals the figure .0116 multiplied by the figure on the revolution counter—2,328.

The miles-per-hour equals the figure .0272 multiplied by the figure on the revolution counter divided by the time consumed.

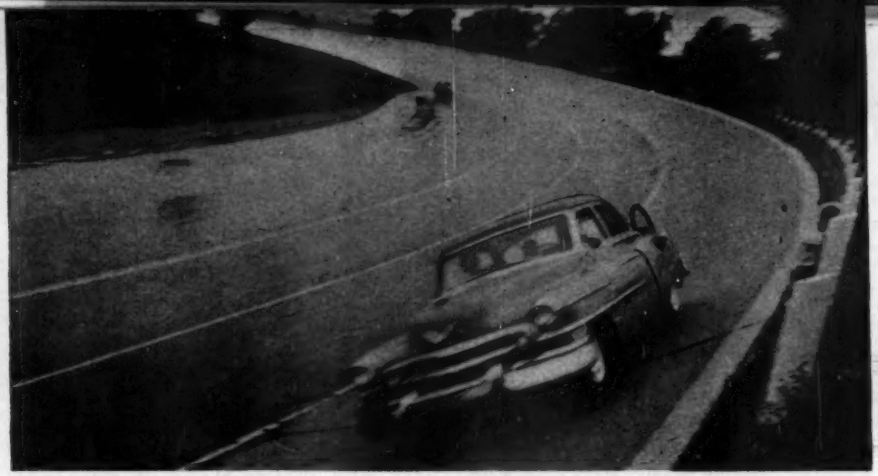
High Compression Lowers Costs

When, as I bent over the black box, the engineer beside me remarked, "There's your answer," he meant the new engine had done better than 27 miles to the gallon going 40 miles an hour.

Up to now, the best performance recorded by the engine is on 100-octane fuel treated with .4 cubic centimeter of tetraethyl lead—the same "booster" compound you get in your own gas. The fuel thus treated goes off the standard octane chart, which stops at 100 octane. GM has no doubt that presently it will be operating the engine satisfactorily on fuel of less than 100 octane.

I drove one of the 12-to-1 engines in a research car on the "Loop" at Milford. The Loop is a research version of a race track. The car, in all but engine and a change in the rear-axle ratio, was a Cadillac.

The new engine has a bore of 3⅞ inches and a stroke of 3¾. That compares with 3 13/16 and 3⅞ inches respectively for the Cadillac's. The block is an Olds, specially bored. Piston displacement is 287 cubic



I drove the new engine at 70 m.p.h. on a wet track. It gets almost 20 m.p.g. at that speed.

inches compared with 331 for the Cadillac's, and the "19XX" develops 15 more horsepower than the maximum brake horsepower of the Caddy. The test car had a rear-axle ratio of 2.75 to 1. The Cadillac's is 3.36 to 1.

In almost every department the car matched the performance of the standard Cadillac. The engine carried me effortlessly into the higher speed ranges. High compression usually causes a little roughness, but I detected no roughness here.

More Mechanical Octanes

Performance matched that of the production engine with a compression ratio of 7.50 to 1. And that's exactly what GM was aiming at. All the added oomph of the 12-to-1 compression was being poured into fuel efficiency—more miles to the gallon. And they were getting the same acceleration and just a bit more top speed, plus better gas mileage, with a considerably smaller piston displacement.

The secret of the engine's performance was a union of "mechanical" and "chemical" octanes. Mechanical octanes, extracting more energy from a gallon of fuel, lie in engine design. An engine with a high mechanical octane rating "rejects" less heat. More of its heat goes into power and less is dissipated through radiator and exhaust.

To make use of its mechanical octanes, the engine had to be fed fuel containing more chemical octanes—gas that would burn better.

And now about that new Hydra-Matic transmission. As I rolled off the Loop and started up a hill on the proving ground, it proved itself. I left another Cadillac, equipped with the regular Hydra-Matic, as though it were standing still. When I slipped the selector lever into an extra notch on the quadrant, the car marched up the hill without that annoying shifting back and forth between gears in response to the torque demand.

In a word, the experimental transmission affords a motorist a dual range for performance. This is the way the selector quadrant on the steering post looked:

It gives you all the advantages of a quick-change rear end without your having to change the gears. For the conservative driver, it affords economy. For the hot-rodder, it offers top performance.

As I coasted into the garage area of the proving ground and switched off the ignition on the new engine, I glanced again at the black box with its two enigmatic dials. It was a sort of portent of the future. END

This Month's Shaw-ism

A safety hint: drive as though everyone else on the road was crazy.

Kilton Shaw

New Ideas from the Inventors

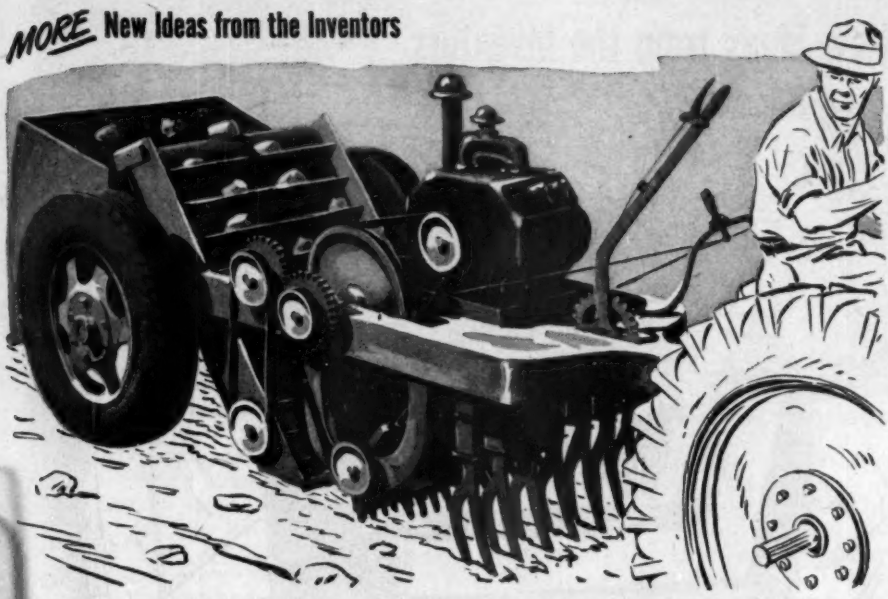
1 Car Seat to Hide Washbasin. This idea would make it easy to wash up after changing a flat—it proposes a washbasin built right into the front seat. Pressing a button on the dashboard would trip a solenoid-operated catch, letting you raise the cushion next to the driver's seat to uncover the washbasin and spigot. Water would be piped to the basin from a tank located in back of the rear seat, as shown in inset.

2 Magnifier to Fit Sewing Machine. Getting the thread through the needle would be simpler with this magnifying lens. It would also give the sewing-machine operator a closer view of the working area. Fitted with a clamp, the attachment would mount on the stem of the machine's presser foot and could be adjusted to any angle.

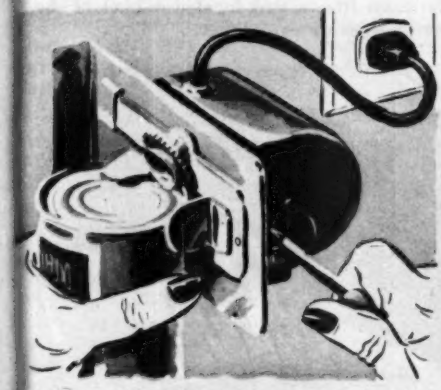
3 Magnetic Iron to Aid Presser. A person wouldn't have to work hard to remove wrinkles from clothes with this magnetic iron. Permanent magnets inside the appliance would hold it firmly down on an iron plate in the ironing board during pressing. To lift the iron, an extra control knob would raise the magnets to reduce their pull.

Please turn the page for three more new ideas.

MORE New Ideas from the Inventors



4 Machine to Pick Up Stones. Pulled by a tractor, this farm machine would dig stones out of the soil and then pick them up and haul them away. The stones would first be loosened by a row of curved teeth. Then a series of rotating claws would throw them onto a conveyor belt to carry them up to a hopper. A small gasoline engine would furnish the power to drive the claws and the conveyor belt.



5 Motor to Turn Can Opener. An electric motor would do the work of opening cans in this invention. Pushing down a lever forces a rotary cutter into the top of the can and automatically switches on the motor. The motor rotates both the cutter and a feed gear that turns the can. Lifting the lever releases the can and shuts off the motor.

6 Dispenser to Light Cigarettes. This dispenser would not only hand you a cigarette but light it for you too. Push a lever and a cigarette drops into a spring-operated well. When the lever is released, the spring tips the well so the cigarette presses against an electric lighter. Lifting out the cigarette would shut off the lighter.

Patents on these inventions have been granted to: 1. P. Bailey, Oakland, Calif.; 2. K. Warner, Chicago; 3. C. Leonard, Cincinnati; 4. A. Cintula, Norwood, Mo.; 5. R. Raab, Rochester, N.Y.; 6. G. Thomas, Long Beach, Calif.

He Turned a Hobby into a Big Business

When the chips were down, young Leo Pavelle put his camera to work. Today, other people's cameras pay him off in fancy money.

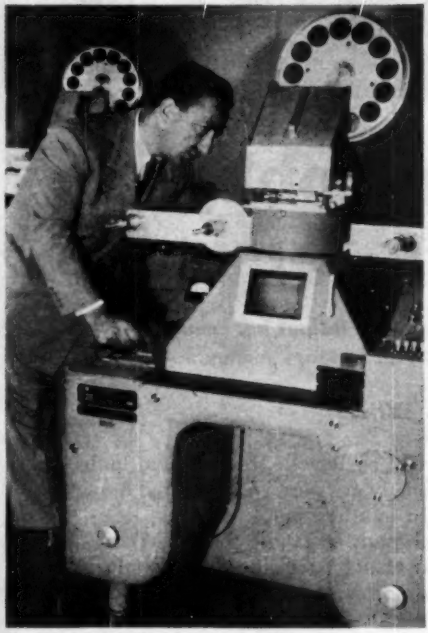
By L. B. White

YOU can't spend two hours talking to Leo Pavelle, the original human photoflash, without wondering how many guys are going around hungry with a fistful of thousand-dollar bills in another suit.

That's right—another suit: nearly everybody has more than one "suit" of talents, skills, know-how—whatever you want to call it. Most people call these spare vocational garments hobbies, and leave 'em hanging in the closet when they go to work.

But Pavelle, the 44-year-old genius of a $2,000,000-a-year photofinishing business that has revolutionized the industry, has been wearing his hobby

Color processing of Printons is automatic in the machine above. Special air-conditioning system that keeps temperature at 72° allows a variance of only one-tenth of a degree.



Automatic enlarger, designed by Leo Pavelle for color work, has been converted to turn out black-and-white enlargements at the rate of 1,000 an hour. It will cut costs considerably.

to the office for 19 years—because the suit he originally ordered, mechanical engineering, came with empty pockets in 1932.

Maybe it would be more accurate to say of this Henry Ford of the hypo tanks that he wore a natty sports jacket over his cosmolene-stained overalls when he stepped out of college with a degree in mechanical engineering. Engineers then were a drug on the market. But he had a hobby and he combined it with his engineering knowledge. One result was a machine that turns out 1,000 enlargements an hour. Another result was a continuous roll printer that grinds out contact prints even faster.

Time for Other Hobbies

And, just in case this jalopy-to-Jaguar success story sounds like all work and no play, let it be noted that several times a year Leo Pavelle slips a hunting or fishing coat over his professional ensemble and whips off to Cape Cod for some surf-casting, or to the High Tetons for elk, deer and grizzly. And almost any evening you can find him in his home workshop in suburban Mount Vernon, hacking out stocks and grips for a gun-and-rod collection that some day may be worth...

But that's another hobby, another shrewd investment—and another story.

Leo Pavelle was born in 1907, in Dvinsk, in what between world wars was reborn Lithuania. His father brought him to New York in 1920—and he proceeded happily through high school and two years of college before the bottom dropped out of everything. The young engineering junior then had to think about how to earn the money to finish school.

On the Road to Photo Fame

Fortunately for him, he had one of the first German Leicas to reach this country. With it, he could do eye-catching work. At first, he made home portraits. Then he won a reputation on Broadway by photographing stage shows during rehearsals. The only hitch was that commercial photofinishers literally did not know what to do with miniatures: they groaned and threw up their hands whenever the midget film came into the shop.

But Leo turned this disappointment into an asset. He studied literature put out by the Leica people and the German photography magazines. If he could get a foot in the door of a finishing plant with adequate facilities, he felt certain he could utilize a

developing process by which silver nitrate is used to deposit a metallic silver layer on the latent image, thus achieving a much finer grain than was then obtainable.

At that particular juncture, he had the good fortune to meet his future wife, Carrie. Carrie's two brothers ran a photofinishing plant. Leo worked there summers during the years he was attending college, earning enough money to complete his education—and at the same time successfully trying out his theories of how to get good enlargements from Leica film.

Better Work Gets Business

Another thing he discovered that summer—one that was to stand him in good stead ever after—was the secret of how to get, and keep, business. He had had the discouraging experience of commercial finishers shrugging off poor prints as the photographer's fault. "You must have underexposed" and "You must have overexposed" were the clichés at camera shop and drugstore pickup counters. The theory seemed to be that amateur snapshooters ought to count themselves lucky if they could identify their subjects at all.

Pavelle, the ex-amateur, felt that anyone who cared enough to invest time, effort and film in his pictures deserved better of the darkroom boys. He experimented with ways to correct under- and overexposure. He scribbled friendly tips on slips of paper and stuck them in with his customers' prints. Soon, through the independent outlets he was building up, he was acquiring a reputation as "the fellow to send your film to." Camera clubs perked up their ears.

Leo Takes a Wife and Partner

In 1932, Leo and Carrie got married and went on their own. Business grew, slowly but steadily. It was hard work, because the Pavelles insisted on craftsmanlike results. Then, in 1933, Zeiss introduced the Contax to America. To Leo Pavelle, who at that time probably had more of a reputation in Germany than in this country, went a fat commission to do a raft of display pictures to advertise the advantages of the new midget for candid work. He spent a week at the famed Bronx Zoo, snapping animals in hundreds of natural split-second poses, and emerged with a hundred 16 by 20 prints that are still considered classics. Magazines then began to page Pavelle for tricky assignments.

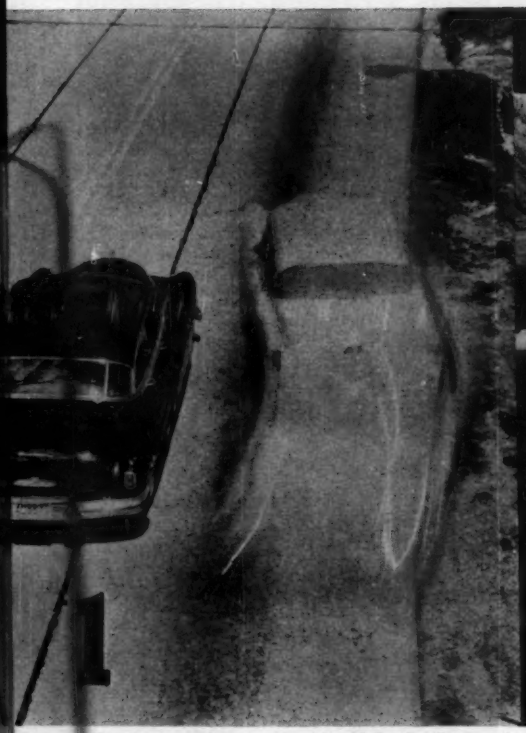
[*Continued on page 244*]

A hunting trophy is added to the growing collection in the Pavelle home in suburban Mount Vernon, N. Y. Here son Arthur helps his Nimrod father hang a prize head for just right effect.

Away from photo lab, hunting and fishing are the boss's favorite relaxations. In addition to an enviable rod-and-gun collection, he owns every type of camera on the market today.

5 DON'TS for Drivers

If you want to drive and stay alive, these photos of the most dangerous highway mistakes show you what not to do.



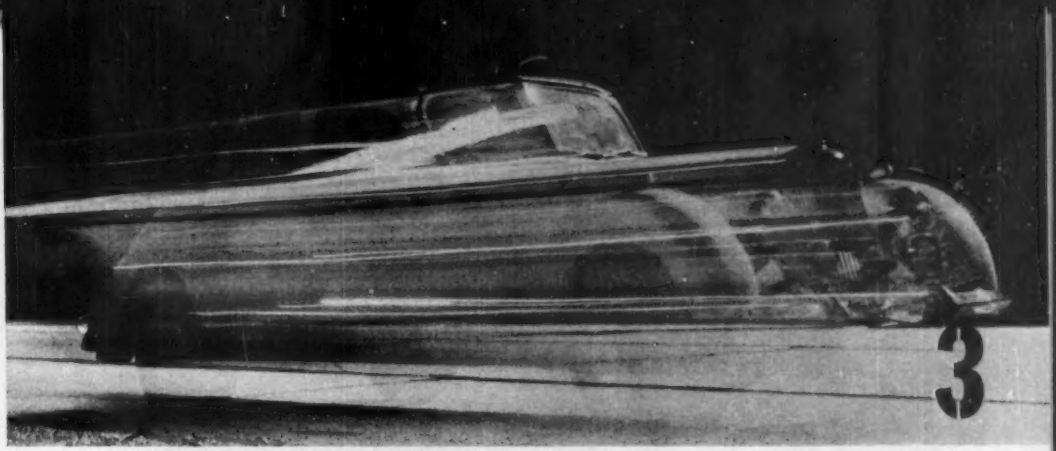
Passing on the wrong side while the driver of the car on the left stubbornly hugs the center line and refuses to move over is one of the commonest—and deadliest—driving errors.

Driving astraddle of the center line is another death-inviting habit. The man hogging the road here may want room in case of a blowout, but he's taking chances, not precautions.

IT LOOKS as though someone is heading for the hospital—or worse. The five pictures on these two pages eloquently illustrate common driving mistakes that account for a substantial portion of the terrible toll of lives on American streets and highways—35,000 people killed each year.

A sixth common error is forgetting that it takes four times as much braking energy to stop a car at 40 m.p.h. as it does at 20.

The "accidents" look real, but they aren't. The cars were photographed standing still by the Standard Oil Co. of New Jersey as part of a safety campaign. Then the car "in motion" was backed up slowly while the shutter of the camera was left open.



Speeding is the Number One highway killer. It took 13,300 lives last year. Observing the legal limit isn't enough—30 m.p.h. can be too fast for some road or traffic conditions.

Driving off the road kills 7,000 persons a year. Blinding lights or swinging too wide when passing may jeopardize the other fellow. And don't forget the centrifugal force on curves.

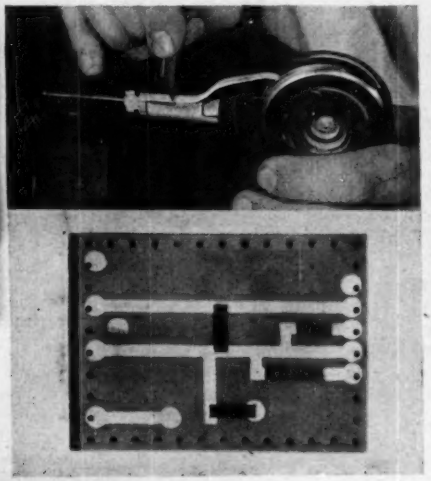
That hand signal in the car broadside to you caused this one. The driver waved for a right turn—and then swung left. Improper signaling causes tens of thousands of smashups.

Crawling Cutter Speeds Coal Mining

THIS German coal-cutting machine could be used in anthracite mining in Pennsylvania, say U. S. Bureau of Mines experts who have tested and adapted it. The husky midget weighs only 1½ tons. Its cutter bar, powered by compressed air instead of electricity for safety, operates at any angle. Bureau of Mines improvements include substituting a miniature tractor tread for wheels and adding dust-control attachments.

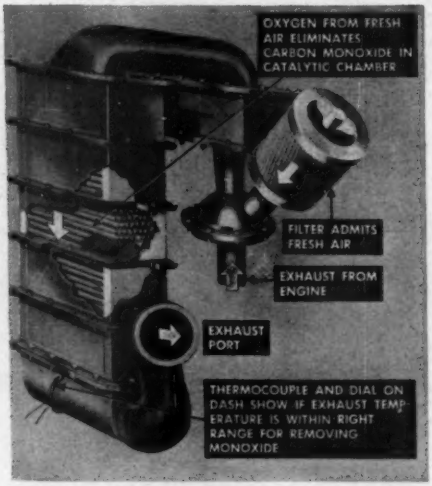
Tape Forms Resistors

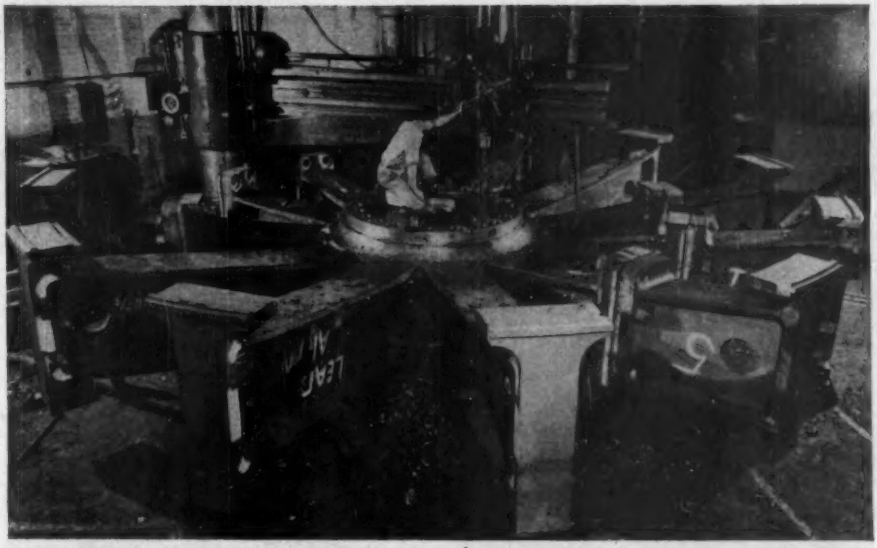
ADHESIVE tape cut from a roll (top view) now forms the resistances in "printed" electric circuits (lower view). It is made of asbestos paper coated with carbon black or graphite. Usual length is one-half inch; for different resistance values, coatings vary.



Muffler Makes Exhaust Safe

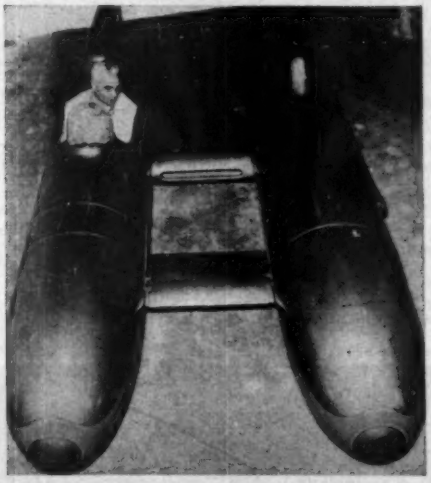
BY MIXING fresh air with exhaust gas in a catalytic chamber, the Houdry muffler below eliminates the lethal carbon monoxide. Following successful operation indoors on factory lift trucks, it will soon be adapted for use on motor cars.





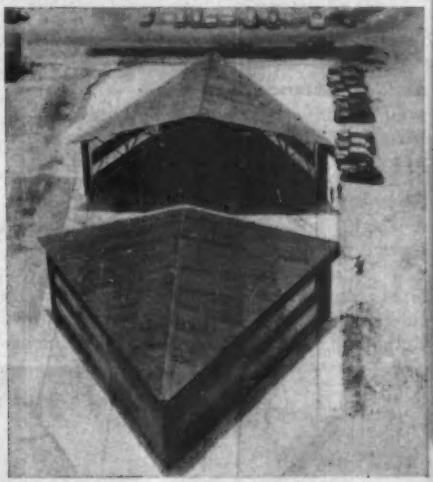
Big Spokes for Big Wheel

MEASURING 25 feet in diameter, the 55-ton "spider" above will form the spokes of a 215-ton rotor in a giant hydroelectric generator at Buggs Island, Va. A waterwheel and 34-ton shaft will spin the Westinghouse rotor to supply power for the nation's defense program. Ends of six of the spider's arms are removable, so that it can pass under bridges en route to its destination.



"Torpedo" Car Hits 191 M.P.H.

EUROPE's hottest hot rod has set two speed records in Italy—186.25 m.p.h. for a mile, 191.34 m.p.h. for a kilometer. Its builder and driver, Piero Taruffi, occupies one of the car's twin torpedo-shaped hulls. The other houses the 280-hp. motor.



Hangar Shuts Up Like Clam

"CLAMSHELL" is what Marines call the world's first mobile hangar—because it works like one. While it's open, Marine planes at Cherry Point, N. C., taxi into place. Then, on wheels and tracks, the self-propelled halves roll together.

Aids to Modern Living

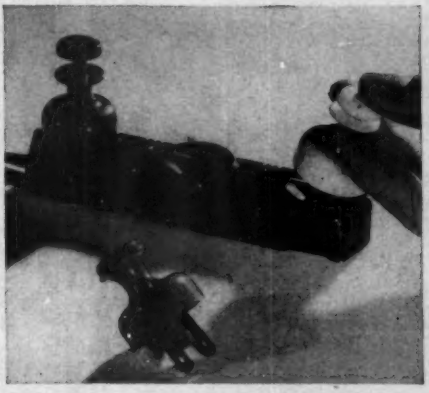
Ladder Balance Bar. Clamp this bar to your ladder and you've something solid to hang onto when washing or painting ceilings. *MacLeod Safety Device, Libertyville, Ill.*

Fold-Away Rubbish Burner. Trash burners add no beauty to the landscape—here's one that hangs out of sight when not in use. *Crown Wire Mfg. Corp., New York City.*

Shaving Aid. Screwed on a shaving-cream tube, this sponge-rubber-and-plastic cap becomes the shaving brush. Moisten sponge, press tube and squeeze lather out. *Lathercap, Brooklyn, N. Y.*

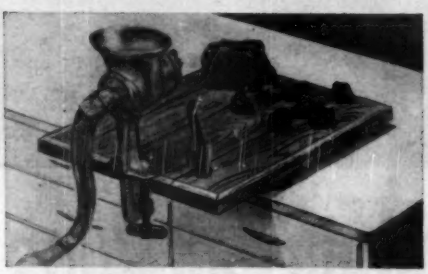
Tank Ball. This plastic float for toilet tanks is said to be permanently watertight. It won't corrode and is unaffected by hard or brackish water. *Amerline, Inc., Chicago.*

Pliable Garbage Pail. All rubber, this garbage can is light to handle, dentproof, rustproof and noiseless. Its top locks in place, holding in odors. *Nesco, Inc., Chicago.*



Pushbutton Plug. Press down on the button in this plug and a plunger releases it from socket without strain on wires or contacts. *Safety Push Plug Co., Toledo.*

One-Piece Handle. Sterling-silver knife handles won't loosen up when made by new process using seamless tubes instead of soldered pieces. *Gorham Co., Providence, R. I.*



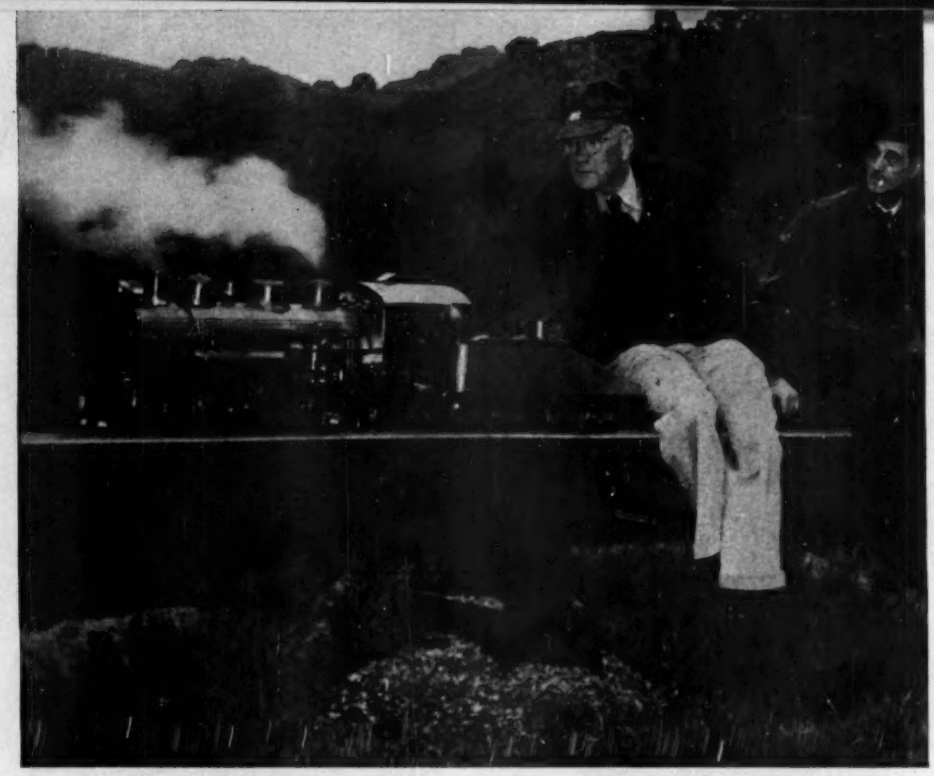
Utility Board. This cutting board with suction-cup feet and extending edge provides place to clamp food chopper. *General Slicing Machine Co., Walden, N. Y.*

Darning Kit. It takes only eight seconds' time and a hot iron to close a hole in your sock with these knitted-fabric patches. *Plasti-Stitch, Inc., New York City.*

Vacuum-Seal Jars. Just press in place the aluminum disks and rubber rings that seal these refrigerator jars, and foods keep fresh for weeks. *The Silex Co., Hartford, Conn.*

Pipe Holster. Hung from your belt, this holder provides a parking place for your pipe while you're working around the house, golfing or fishing. *The Village Store, Lake Placid, N. Y.*

Long-Range Mop. Pull this duster with the wooly yarn head over a broom to reach cobwebs on the ceiling, or dust furniture legs without stooping. *Magic Mop Co., Chicago.*



Outdoor Model Railroad Runs

Fantastically intricate models burn coal, operate on live steam and chug around California hills like big ones.

TO GET a ride on this railroad, you don't buy a ticket—you build a locomotive. One that runs. That's the club's way of keeping out the dabblers and the slackers—you have to work before you can play.

These rare model railroaders have another odd notion—they think steam engines should run on steam. Live, hot, high-pressure stuff, ready to blow its boiler's top if you'd let it. Hence the club's name, the Golden Gate Live Steamers.

Most any Sunday afternoon you can find its members in the rolling hills of Oakland, Calif., riding around a sprawling elevated track behind a locomotive that's never been on a dynamometer but whose drawbar pull is exactly eight grown men and two boys.

The only thing small is the scale. The thrills are full-size. Side rods flash, and the stack spits black. You can feel the heat of the firebox on your face, and hear the labored chug on a long upgrade. You can smell the hot, moist pungence of live steam pushing up close to the safety limit, and the acrid odor of bearing oil running hot under a load many times the engine's weight. And all the time you keep your eyes glued to the rising needle on the pressure gauge.

There Are Breakdowns, Too

Then the heart-breaking moment when the crown sheet threatens to run dry and the boiler is in danger of blowing, or an injector valve fouls and the water pressure drops. Back goes the engine to the club's repair yards—the basement workshop of the club's originator, Vic Shattock.

Shattock, a Southern Pacific plumbing supervisor, got the idea for the club when he was tooling locomotives in his basement.

Biggest live-steam locomotive is 0-6-0 Southern Pacific switcher that hauls 10 men on four flatcars. Built to one-inch scale, engine and tender weigh 250 pounds, measure five feet long.

on Real Steam

He wanted an outdoor setting, where his engines would have light and air and space, and he wanted only members who loved steam locomotives well enough to build one.

Railroad Donates Timbers

Shattock asked his friends and turned up a handful who showed interest. The Eastbay Regional Parks Board came up with a site in Redwood Park just outside downtown Oakland. The Southern Pacific Railroad donated discarded rail ties and bridge timbers for construction of the big track.

Then the work began. Scott E. Gordon, present club president and professionally a railroad civil engineer, mapped the site. From his plans, the track took shape. A total of 147 wood piers rose on beds of crushed rock. Bridge ties became beams to support the track, and light aluminum rails were spiked down on slender wood ties.

That was three years ago. Now the club

Special four-rail track takes three gauges of locomotives—2½-inch gauge for ½-inch-to-the-foot scale; 3½-inch gauge for ¾-inch scale; and 4¾-inch gauge for the big one-inchers.

Tiny boiler tubes must be periodically scraped clean with gun rod to keep them from fouling. Use of distilled water cuts down scale deposit.

Most models are reproductions, but this dockside switcher is an original design. It weighs 100 pounds, burns wood alcohol instead of coal.

boasts 49 members and 1,331 feet of continuous track. The trestle's 30-inch height permits engineers and passengers to ride side-saddle behind their chugging engines on cushion-padded flatcars. Four rails laid side by side take locomotives of three gauges —2½ inches, 3½ inches and 4¾ inches.

Down long straightaways and around carefully banked curves glide precision-built scale models of prototype locomotives—the big compound articulated Mallets, mountain-climbing Mikados, Pacifics, Hudsons, and the homely dockside switchers.

Aluminum rails are spiked down on eight-inch wood ties. Continuous 30-inch-high, 1,331-foot-long trestle is made of old railroad bridge ties, donated by Southern Pacific, resting on 147 piers.

Engines Take Thousands of Hours

All of them run—there are no non-operating showpieces on this railroad—and they all run on steam. Normal running pressure is around 100 pounds, with the safety valve set to open at about 120. Boilers, usually made of brazed copper or welded steel, are first tested at 200 pounds or more.

Most engines burn real coal, either crushed or in the form of briquettes, while a few burn alcohol. On most, all of the parts are fully operating, from the Johnson bar—which does for a steam engine what a gear-shift does for a car—right down to the sand domes and the steam-driven water injectors. And each represents a spare-time investment of 1,000 to 5,000 hours in the most exacting work with lathes, drill presses, hand files—and ten-thousandth-of-an-inch tolerances.

Indoor Tracks Test Locos

Inside Shattock's basement workshop are more examples of the railroaders' craftsmanship. An authentic reproduction of a trackside water tank fills a waiting New York Central "870." An electrically operated turntable reverses locomotives, while a roundhouse shelters a pair of 4-6-2 Pacifics flanked by a pair of 2-8-2 Mikados. Short lengths of test tracks, set up around the walls of the cellar, hold an assortment of engines and

Firing up. Loco gets help from small electric pump that draws air through stack to fan flames. Once fire is going, steam jet creates draft.

Ready to hit the high iron, this mighty 2-8-2 Mikado blows steam as she gets up pressure. Throttle and steam-pressure gauge are in cab.

running gear in various stages of assembly.

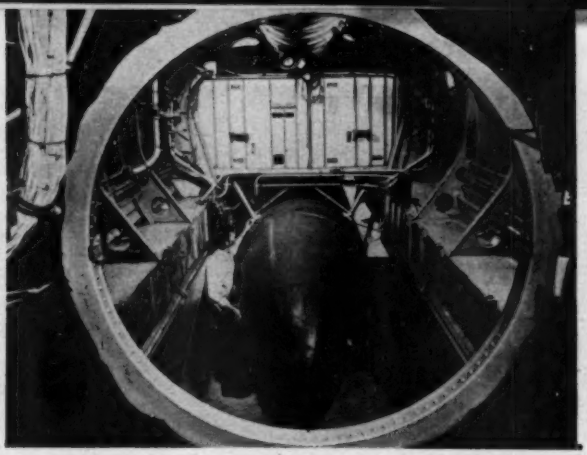
But the real railroad is outdoors, where papier-mache and cardboard are no match for the natural scenic beauty. And it runs like any self-respecting railroad should—under its own steam. END

Read how one man runs his mammoth model railroad like a real road in P.S. next month.

In club's basement workshop, famous old "999" takes on water from replica of familiar trackside tank. Larger version of water tank will be built for use by members on outdoor track.

Big Bomb Tight Fit in B-29 Bomb Bays

HERE's a 44,000-lb. blockbuster that's going to make an extra big hole in the ground when it's dropped for real. So large that it takes up space in two bomb bays and still sticks out of the plane, the giant bomb is shown at right attached to the specially designed cradle needed to hold it aboard a Boeing B-29 Superfortress.

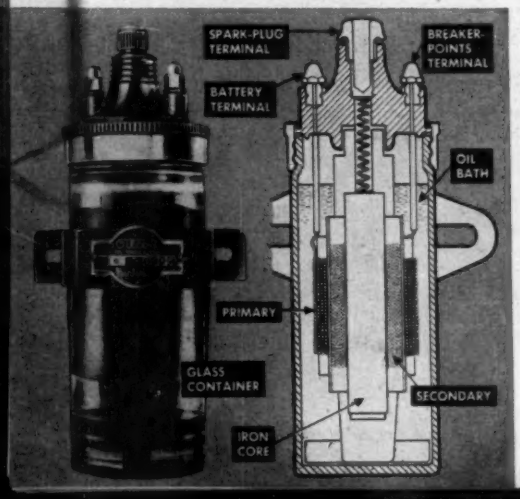


Stapler Fastens Building Rods

STEEL rods for reinforcing concrete are usually wired together laboriously by hand. Now a new German-made machine does the job at the squeeze of the hand—just like using an office stapler to join papers.

Nutshells Power Taxicab

SPAIN's answer to the scarcity of gasoline is—Nuts. Shells from the plentiful almond are being burned in converters to provide a combustible gas that can power automobiles like the taxicab above.

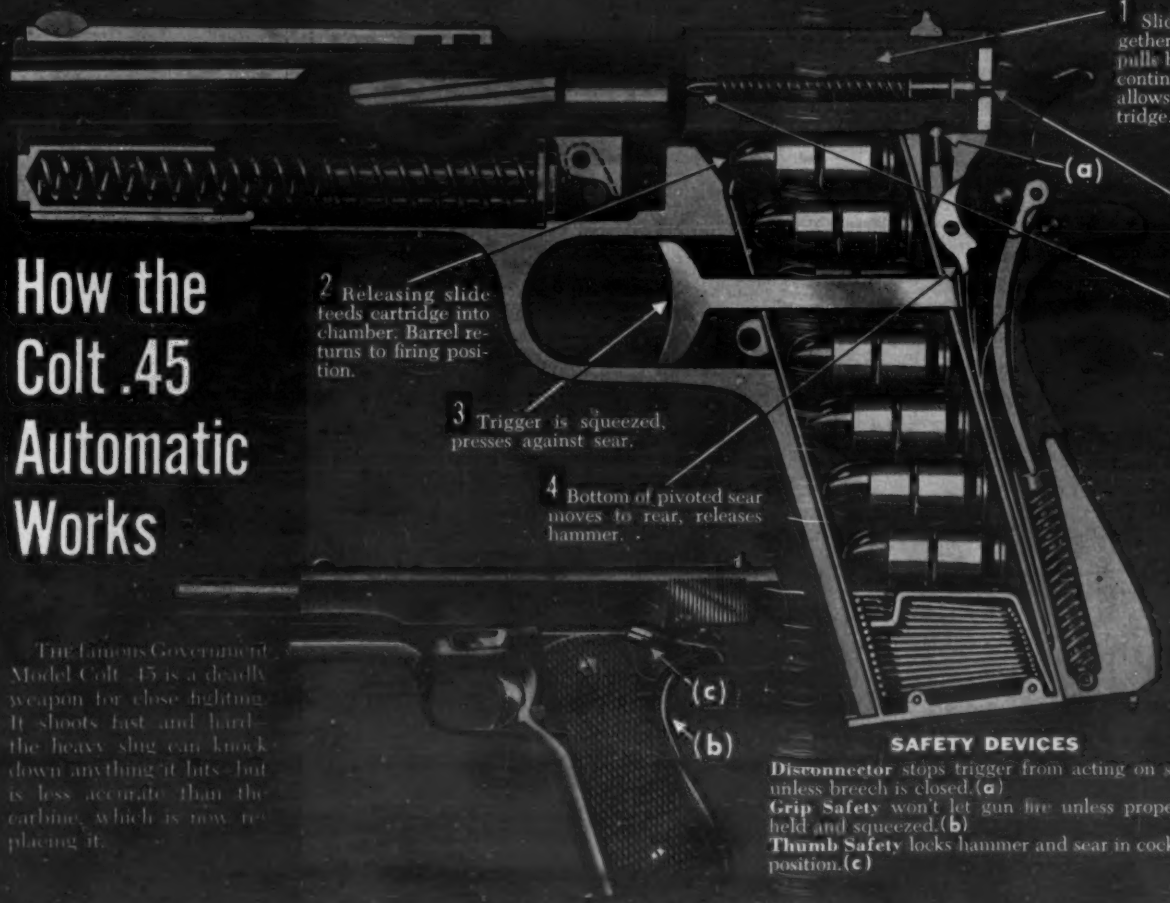


Oil Cools Auto Ignition Coil

THIS new auto ignition coil is insulated and cooled by circulating oil, just like giant transformers in power stations. The oil-bathed windings are said to produce higher voltages, with a hotter and fatter spark at the plug gap. This improves acceleration and starting and increases gas mileage by firing fuel mixtures that might otherwise misfire or refuse to ignite at all.

The outer covering is tough transparent glass, which reduces electrical losses metal containers sometimes cause. Oilcoil, made in England, is sold in this country by Harry H. Lederer Co., Los Angeles.

How the Colt .45 Automatic Works



1 Slide and barrel, locked together, are pulled to rear. Link pulls barrel down, stops it. Slide continues to rear, cocks hammer, allows spring to push up cartridge.

2 Releasing slide feeds cartridge into chamber. Barrel returns to firing position.

3 Trigger is squeezed, presses against sear.

4 Bottom of pivoted sear moves to rear, releases hammer.

5 Hammer falls, striking base of firing pin.

6 Firing pin flies forward through breechblock, striking primer of cartridge and exploding it.

7 Recoil drives barrel and slide to rear. Loading-and-cocking procedure is automatically repeated.

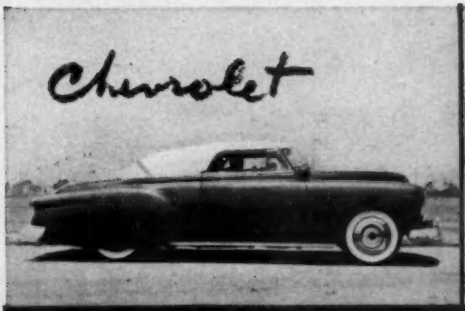
THE famous Government Model Colt .45 is a deadly weapon for close fighting. It shoots fast and hard—the heavy slug can knock down anything it hits—but is less accurate than the carbine, which is now replacing it.

SAFETY DEVICES

Disconnector stops trigger from acting on sear unless breech is closed.(a)
Grip Safety won't let gun fire unless properly held and squeezed.(b)
Thumb Safety locks hammer and sear in cocked position.(c)

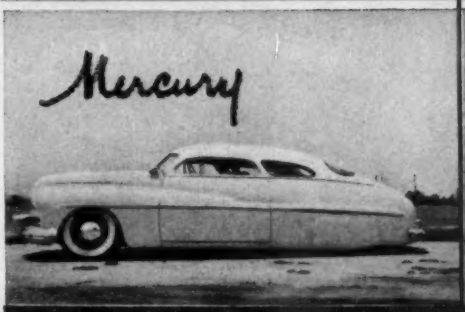
Know Your Weapons

These Cars Are

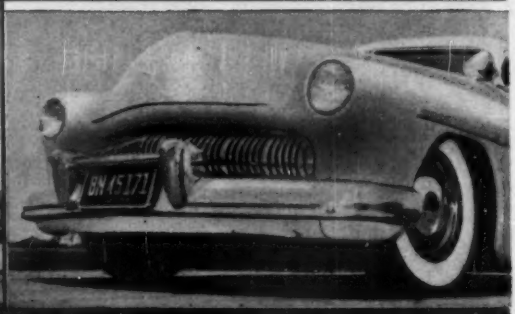


The owner of this '49 Chevrolet convertible didn't know his own car when it emerged from the Barris brothers' custom conversion shop.

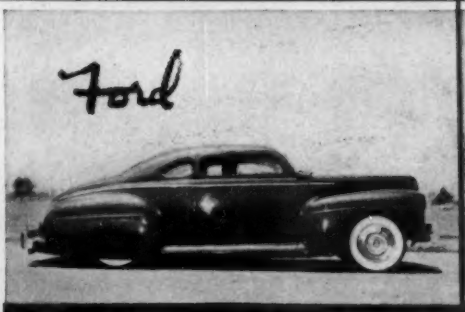
Soft top is built over steel frame. Rear part funnels back to '50 Olds tail lights. Rear windows are removed by unsnapping a padded strip.



No '49 Mercury came off the assembly line looking like this individualized job. Top was redesigned and cut down to slant toward the rear.



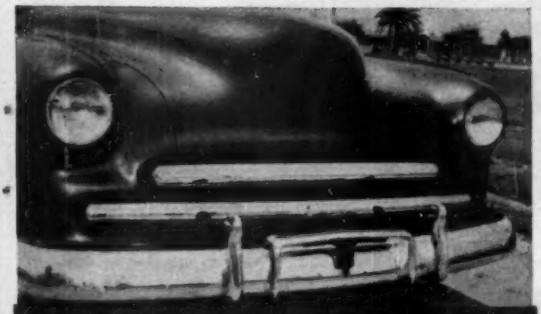
Grille is one-piece, fits within big, oval jet-like intake. Headlights and front end were molded as single piece for smooth appearance.



A '41 Ford coupe travels in luxury to which it was never accustomed. One of many features is one-piece body, molded from front to rear.

That's a '48 Cadillac grille dressing up the '41 Ford. Twin spotlights on front corner posts break up sweeping, tapered body line.

Tailored to Order



The grille is rubber-mounted in steel frame and attached to body by spring-mounted bolts. Grille may be bumped without shock to body.

Stubby radio antenna projects only four inches retracted, can be extended to 12 inches. Lucite tail lights are formed into bumper guards.

The driver gets into his car "no hands." He simply touches a button with the toe of his shoe, and an electric motor opens the door.

When the Barris brothers redesign a car to look like what it isn't, they add luxury lines and gadgets galore.

By Andrew R. Boone

TAKE a good look at the photos at the left and you'll see why car identification might become a guessing game along Southern California highways. When a Mercury body on a Ford frame powered by an Olds Rocket engine zips past, even the experts are likely to give it a double-take.

What is it?

It's a Barris car.

The brothers Barris, George, 24, and Sam, 25, perform their auto alchemy in a shop at Lynwood, a suburb of Los Angeles. If you were to pay them a visit, you'd find a small garage jammed to the walls with cars in all stages of repair, from a wrecked and burned Ford to a gleaming Cadillac receiving its final gloss. You might recognize the battered Ford, but the chances are good that you'd never know the Cad. The brothers pride themselves, when turning out what they call a Barris Kustom Car, in creating a design so individual in appearance that even its original maker wouldn't recognize their re-creation.

Business Born in High School

It started 10 years ago when the two brothers, then students at San Juan High School in Sacramento, became dissatisfied with the lines of their knockabout Ford coupe. Laboring after school and week ends, they changed its body into something that sent their pals into a rave of teen-talk superlatives. That decided them to turn their hobby into a business.

The next decade was a busy one for George and Sam. During those 10 years they have:

- Restyled more than 1,000 cars, each different from all the others.
- Made both removable tops and removable windows in a variety of styles.
- Devised push-button mechanisms for

Here's how customized '49 Mercury shown on preceding page compares with a stock model of the same vintage. Reworked job is lower, narrower. Body clears road by only three inches.

Teamwork does it. While George Barris works on a cutaway drawing for the undercarriage of a sports-car conversion, brother Sam stands by figuring out best way to do the shop work.

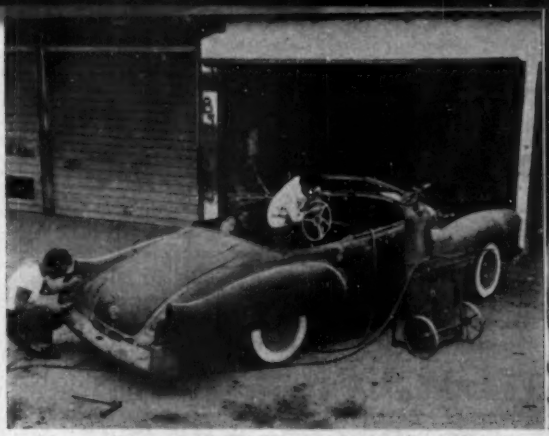
Unusual combination is discussed in conference with customers. '50 Mercury body on '50 Ford frame is what they want. An Oldsmobile Rocket engine will power the sleek speedster.

electrically opening hoods, doors, windows and trunk compartments.

- Built novel and handsome floating grilles.
- Produced flowing, ground-hugging designs that have become the trade-mark of their design and workmanship from coast to coast.

A Barris job may start with any heap of junk—perhaps little more than a chassis, engine, drive and gears. Their work begins not with metal forming but with drawings. That's George's department. High-school training in art and mechanical drawing and a facility for expressing design ideas quickly enable him to put on paper both pictures of the completed car and cutaway drawings of individual sections. The owner learns in a jiffy whether he will like George's proposal.

Most important ingredients in their prize-winning creations are design originality and workmanship. More than 50 trophies, awarded at auto shows for design, style, beauty and workmanship, attest their skill



A conversion job gets the works. This '41 Buick convertible has been lowered 14 inches. Cadillac fenders, lengthened four inches, have been raised on body to give road clearance.

George molds and leads newly created panels for grille and sealed headlights, using a hickory paddle that he slides gently across soft lead kept warm with a blowtorch.

Glass is installed in a tail light that has been welded onto side of rear fender. Extension was formed out of same kind of cold-rolled steel that is used for body building.

Bare metal must be really clean or paint won't stick. Here Sam uses coarse-tooth file. He'll follow with rotary grinder. Then come sanding, priming, painting, glazing, waxing.

and ingenuity. And there's no great secret to their success.

"Make 'em look good and keep 'em close to the ground," is the Barris formula. Neither George nor Sam goes along with the goop-and-gingerbread school. You'll see no foxtails and very little chrome on their cars. No pipes extend from Barris recreations, and radio antennas are all but hidden in a bumper or body. Seldom does a handle appear on the doors. The driver pushes a button, and electricity or the vacuum system takes over. Sometimes there's a luxury and hot-rod combination, like a '41 Ford convertible with a racing engine. It gets up to 93 m.p.h. in a quarter mile from a dead stop.

"Channel and drop" is a by-phrase in their busy shop. Customers, mostly among the younger set, want both novelty and low lines. The top may be lowered, body narrowed, fenders lengthened, wheelbase shortened. Even on a minor, superficial changeover, the brothers make certain that some

Three rear windows of customized convertible are easily taken out by unsnapping a padded strip, as above. On some jobs windows are part of the top, but can be unscrewed for removal.

This cylinder once lifted the top of a '41 Chevvie convertible. Now it raises the trunk lid of a converted '49 Chevvie. It operates off vacuum manifold through a three-way switch.

Push buttons on dash at left of steering wheel operate pneumatic controls that automatically open doors, raise hood and open trunk cover. On some jobs, controls are hydraulic.

feature differs from those found on all other cars. It may be no more than a streamlined tail-light bracket.

On a major redesign, Sam strips the car down to its skeleton. New fenders are formed. Altered components are rewelded. Sam cuts down or builds new doors, painstakingly fitting them. George fairs in adjoining metal with lead. Sam reams out all holes, fills them with braze metal, shrinks the plugs in tightly, files all spots for painting.

Together, Sam and George finish the interior. A chrome-and-red-plastic dash goes into a Chevvie coupe; two-toned upholstery, piped and rolled, into a Merc convertible. Painting comes last, but this is by no means the least part of their efforts. Guide coat, sanding, two coats of sealer, 25 paint coats (each block sanded), frequent rubbing, final glazing and waxing.

Show Cars Must Shine

It all adds up in cost, but both George and Sam insist upon plenty of paint. Many of these beauties are entered in shows. Only an adequate protective body can withstand the repeated polishing that grooms a car to prize-winning luster.

As the idea man, George prides himself on a hatful of new wrinkles. He sported curb feelers on his first car, 10 years ago. Soon he began slanting tops downward toward the rear to achieve sweeping lines. But too much sweep can become monotonous. So he adds twin spotlights on front corner posts to get a two-step appearance. On many cars he removes the drain-mold system, relying upon tight door fits to keep the water out.

Buick Has Built-in Bar

He's especially proud of a converted '49 Buick. A complete cocktail bar slides out from the rear seat at the touch of a button. The boys plan a superdooper Cadillac. Today it stands in an out-of-the-way garage, gutted by fire. Refurbished, the Cad will carry all-pneumatic controls, a rear-seat bar, a television set recessed in the front seat and a pair of wheels on stilts that can be lowered to raise the low-slung rear body over sharp dips in the highway.

As new ideas come along, George will sketch them, Sam will execute them. That's the way these designer-builders already have achieved success in a business that demands lots of talent and enterprise. END

Keeping the Home Shipshape

Nail kegs will protect small shrubs from winter frost damage. Saw off the lower third, but leave two opposite staves full length. Point these so that they can be embedded in the ground.

Use a clean oil can to feed liquid medicines to a pet. Squirt the medication into the back of pet's mouth, if open; or squirt it in at the side if you can't open the jaws.

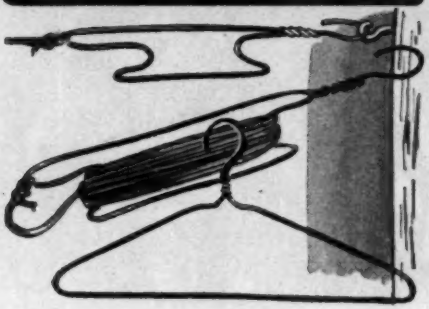
Pot lids stack neatly and conveniently in a wire napkin rack. Stand it ready at hand on a counter top or mount it on a sliding board in a kitchen cabinet.

You won't have to stoop so far to pick up sweepings if you make a simple change in the handle of your dustpan brush. Cut it off, then replace at an angle as above.

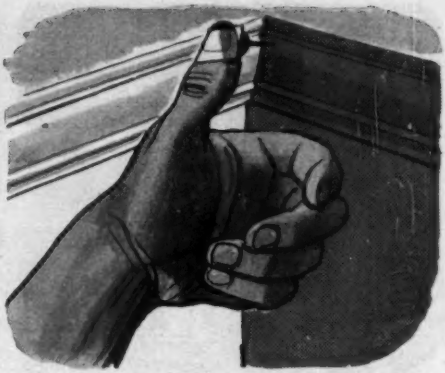
If you have a home freezer, save empty milk cartons. They're fine containers for freezing all kinds of foods. Slice off the top so that it can be replaced and sealed with tape.

Please turn the page for five more suggestions.

Keeping the Home Shipshape

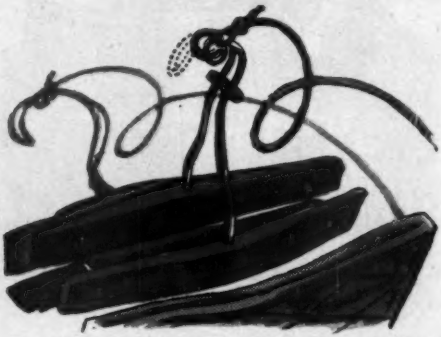


A clothesline reel that's handy for light laundry can be made by bending a heavy-wire hanger. Put a hook on the opposite end of the line to eliminate tying and untying.



When hanging party decorations, you can push tacks into corners where your hand won't fit if you wrap tape around your thumb, sticky side out. Tack heads will cling to the tape.

Old candle ends thrown in the fireplace or furnace will make it easier to start your fire. Paper and kindling will ignite the wax, which will help wood or coal catch fire faster.



To fish insulation batts through a finished wall, try using a trouser hanger as your hook. You can make it grip tightly by driving two brads through each side of the hanger.

Heavy plastic place mats make attractive and long-lasting splash guards for use behind kitchen and bathroom sinks. Attach them to the wall with cement or decorative tacks.

Airplane Seats Face Rear

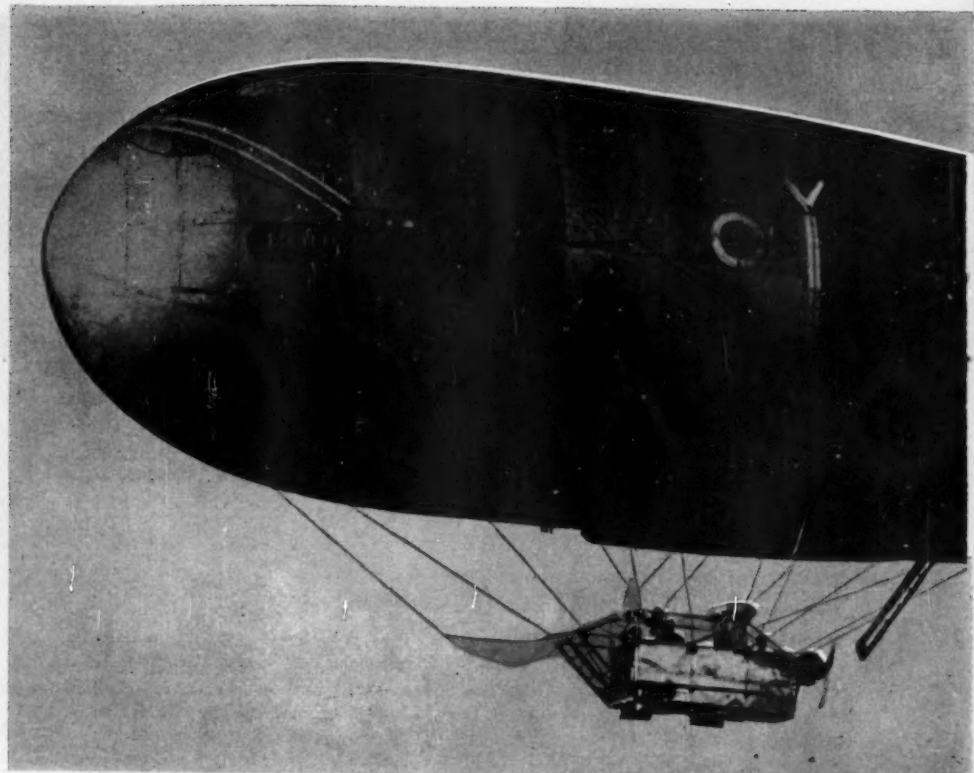
THE front of this Boeing C-97 transport is *behind* the passengers, who face the tail of the plane. Rear-facing seats, long favored by safety experts because they provide extra support for head, shoulders and body in the event of a crash, have now been adopted by the Military Air Transport Service for all its new planes. When the seats aren't in use, they can be folded flat, as in right foreground, and then against the cabin walls so that the space may be used for cargo.

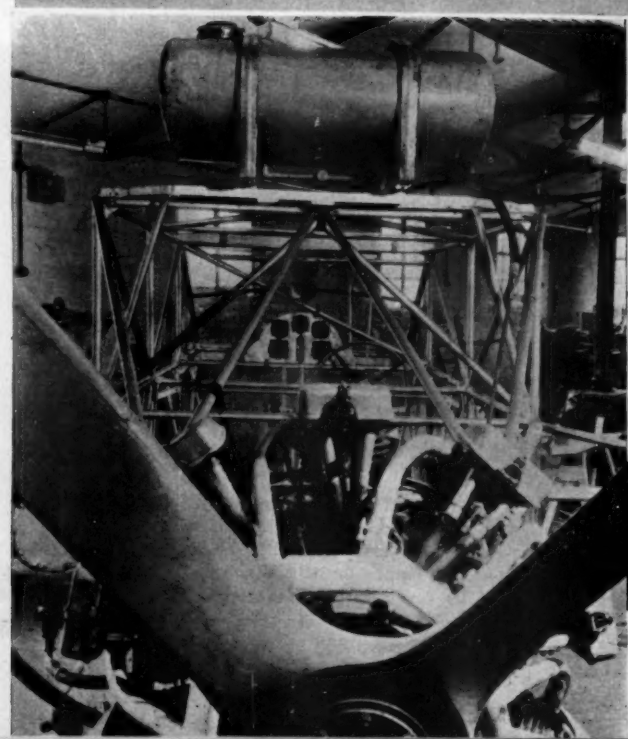
Biggest Prism Weighs 300 Lb.

THIS 300-pound piece of glass, said to be the world's largest prism, is 33 inches across. Its two faces were ground within two-millionths inch of perfect flatness by the Perkin-Elmer Corp. for a telescope at the Harvard Observatory in South Africa.

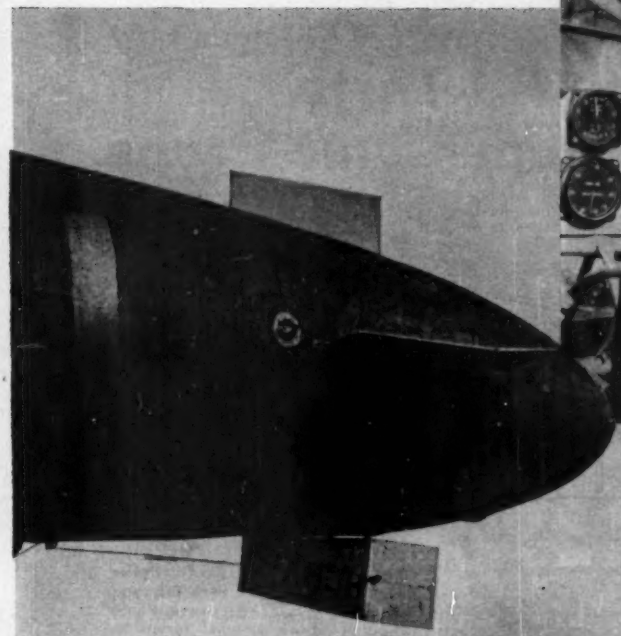
Clock Feeds the Dog

SET the clock in the feeder above, and when chow time arrives the food pan slides out of covered section at right—ready for hungry Fido. To make sure he knows dinner's on, a bell rings at the same time. It's made by Evernu Products, San Francisco.





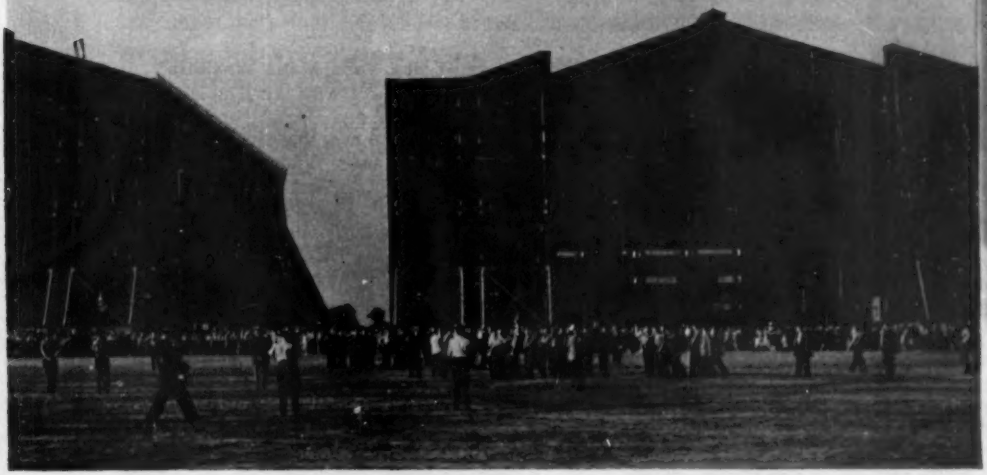
Boxlike construction of four-place aluminum-alloy gondola is shown at left. Gas tank holds 29 gal., enough for 10-hour flight at 30 m.p.h.



Airship Club member adjusts a clip during construction of gondola. His arm rests on rudder control, and on his left are elevator controls. Envelope for craft was bought from RAF, redesigned.

They Built a Blimp for Fun

THE 250 members of the Airship Club of Great Britain designed and built this blimp, the Bournemouth, with $7,000 of their own money. It's the first such airship to be made in England since the crash of the R101 in 1930. The nonrigid bag is 108 feet long, 27 feet in diameter and holds 45,000 cubic feet of hydrogen. A 75-hp. engine drives its propeller, and it does 45 m.p.h. Shortly after these pictures were taken, a tow rope caught on a building and the gas bag was torn, but no one was hurt.



Spin Pit Tortures Supersonic Props

Spin pit is a buried steel cylinder about 13 feet in diameter and eight feet high. A conventional propeller above ground serves as cooling fan and governor for the driving engine.

BURIED in the ground at Dayton, Ohio, is a new kind of laboratory—one that tests propellers designed to fly planes faster than the speed of sound.

The world's first supersonic-propeller spin pit has just been put in operation by the Aeroproducts Division of General Motors. In it, props are whirled at superspeeds to see what kind of stresses they develop. Contrary to the belief generally held a few years ago, it is now thought that propellers—as well as jet engines—can be used to drive airplanes through the speed of sound and beyond.

Built to hasten research on the shapes of such propellers, the spin pit has a vacuum pump that enables the operator to simulate various atmospheric pressures under which the propellers will operate at high altitude. And with reduced atmosphere, low horsepower can spin props at high r.p.m.

An engineer inside pit checks an electrical pickup that indicates stresses propeller is subjected to during test runs. The prop blades shown here are of conventional design.

Conduit-Box Tabs Make Washers

LARGE washers with small holes are not always easy to find. I make my own from the round metal tabs that electricians punch from conduit boxes. When I need a washer, I select a tab of the right size from my collection and drill a hole through it.—*J. C. Branstetter, San Francisco.*

New Drug Is Stronger than Morphine

A NEW pain-killing drug, said to be more powerful and longer-acting than morphine, may help make this country independent of foreign sources of opiates. A synthetic, Dromoran, or 3-hydroxy-N-methyl-morphinan, was first produced by a German chemist, Dr. Rudolf Grewe. Closely related to morphine, it is habit-forming.

New Sprayers Walk and Crawl

THESE two extremes in new weapons for the war on bugs were demonstrated recently at an international agricultural conference in London. The donkey packs a small gasoline engine hooked to a fan that blows dust from a hopper through three flexible pipes tipped with double-barreled nozzles. The motorized sprayer at right, built on a narrow-gauge crawler tractor, has a glass-windowed cab to protect the operator from noxious mist laid down by a battery of jets in the rear. It carries 200 gallons of liquid insecticide or weed killer.

British Jet Tries New Wing

LATEST product of Britain's research in jet planes is this H.P. 88, shown after completing its first test flight. The high-speed prototype sports an experimental wing and is powered by a Rolls Royce Nene turbojet engine. It was built jointly by Handley Page and Blackburn and General Aircraft.

Sky Chef Serves Bomber Crew

THE old Air Corps was never like this. Aboard the B-36 superbomber a two-burner electric stove with built-in icebox brings some of the comforts of home to crews on 30- to 40-hour missions. Crew in forward compartment will receive hot food by means of a conveyor belt that travels through the 85-foot communications tunnel. Other features intended to increase crew effectiveness and prevent fatigue are lavatories with washbasins, hot and cold running water, and even shaving mirrors.

GI Truck Gets Automatic Drive

By Herbert O. Johansen

EVEN the Army's worst driver would find it hard to snafu a convoy with this six-by-six. I came to that conclusion after a preview drive in the new military super-truck over the ruts, bumps, bogs and 60-percent grade (photo at top left) of the Billy Goat course of General Motors' proving ground at Milford, Mich.

Anybody who can operate a steering wheel can run this job. Hydra-Matic transmission, with eight speeds forward and two in reverse, does the job of gear selection almost automatically even in the toughest battlefront terrain. On the highway, power goes only to the two rear axles. But when the truck suddenly hits rough ground, causing the rear wheels to lose traction, power is automatically applied to the front wheels.

Smoother ride is gained by torque-rod suspension for front axle (arrow under front of truck below). Rods relieve springs from having to fight forward and rearward torsional effects. Consequently they do not have to be so stiff and rugged.

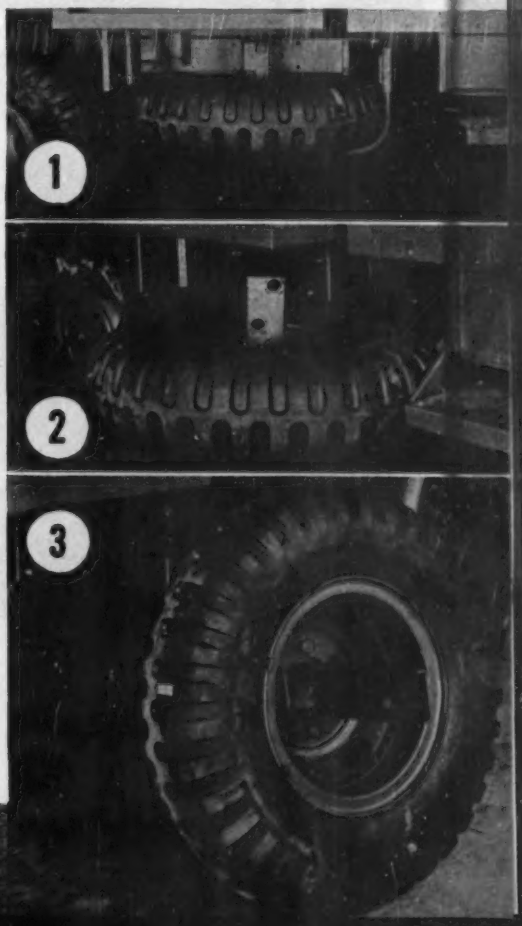
One lever does the work. Shown in its different positions above, it handles all transmission control. Engagement of front-wheel drive is automatic. Only choice driver has to make is selecting high or low range, "level" or "hilly" in either range.

A new six-cylinder (302 cu. in.) engine, developing 145 hp., gives the GM six-by-six (meaning six wheels, all six power-driven) a top speed of 58 m.p.h. under a five-ton load. And with a full load, it can tow a five-ton 155-mm. gun behind it.

Snorkel devices enable the M-135 vehicle to make like a submarine. While older models could be adapted for underwater rides, the new truck has the sealed transfer case, transmission and the rest built in. When about to submerge, the driver flips a switch, forcing compressed air into these units to keep them bone dry.

Another improvement is torque-rod suspension in combination with regular leaf springs. These rods let the axles move up and down, but not forward or rearward. The result: a smoother ride and rabbit speeds over mountain-goat country. END

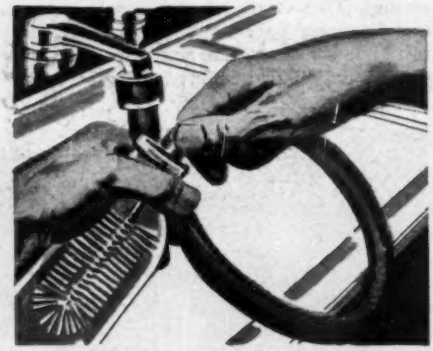
Service is faster on the new GM six-by-six. Tire change, shown at right, is an example. 1. Tire in driving position under chassis. 2. Two nuts are removed and the spare-tire assembly swings outward. 3. Pivoted on hinge, tire is ready to be rolled into position for change.



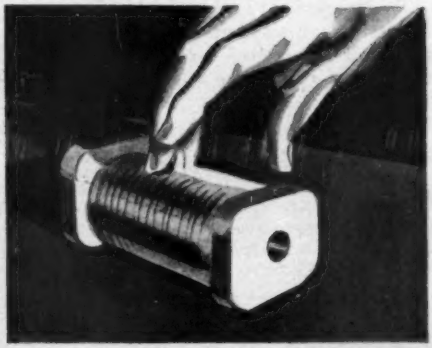
I'd like to see them make . . .

* Everyone has his own pet idea of some gadget he would like to see in general use. What is YOURS? *Popular Science* will pay $5.00 for each one published. Use government postcards only. Contributions cannot be acknowledged or returned.

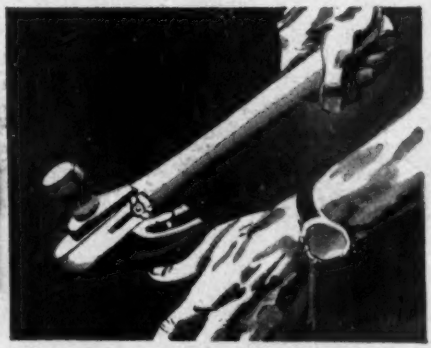
Automobile cylinder heads with bolt holes numbered in the order in which the bolts should be tightened. Proper tension for tightening nuts and spark plugs could also be indicated. —*George A. Jacobs, New Haven, Conn.*



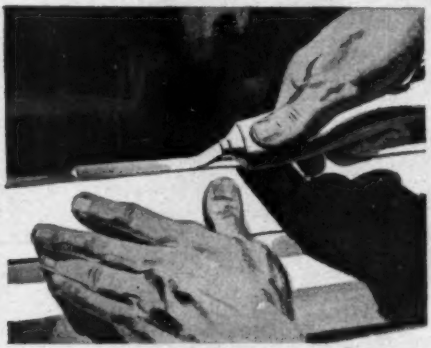
A bottle-washing brush that attaches to the faucet and is rotated by waterpower. Add a built-in soap feeder so soapy water would squirt out through holes around the bristles.—*Mrs. Dorothy Riley, Brooklyn.*



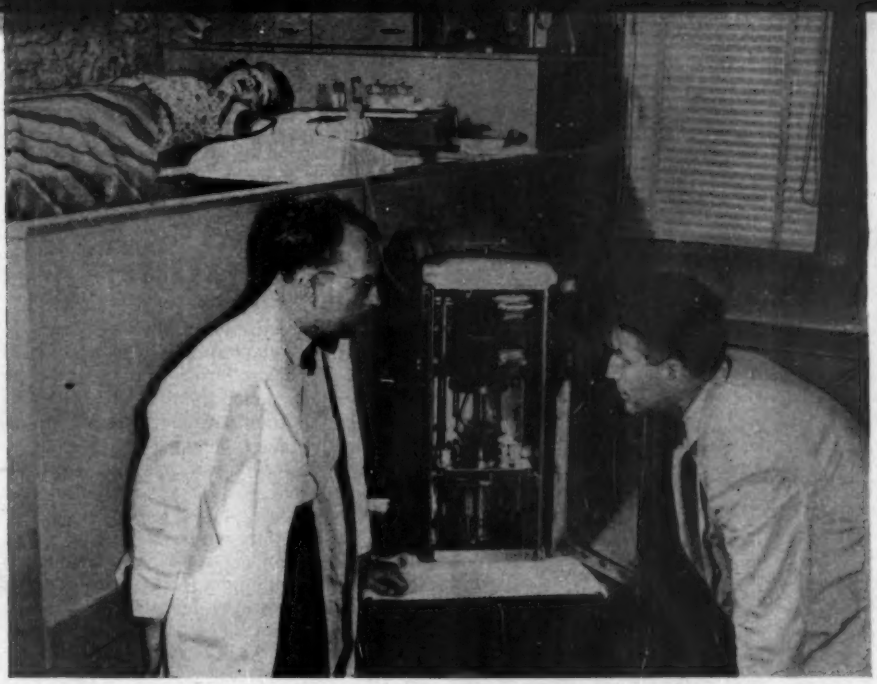
Square flanges on spools of sewing thread, magnet wire, and the like. If you dropped such a spool, it would stay put instead of rolling out of sight and unwinding its contents on the way. —*Martin Reddoor, Poplar, Mont.*



A hammer with a U-shaped rocker fitted over the head and fastened with wing nuts. Adjusted as a fulcrum for the head, it would give leverage for pulling nails, eliminating need for a block. —*Arthur Ammann, Brooklyn.*



Putty in collapsible tubes with triangular neck openings. The putty would be extruded in a triangular strip, ready-shaped for application in the glass rabbet of window sash.—*H. Wadron, White Plains, N. Y.*



Fast Separation Preserves Blood

A SUITCASE-SIZE blood refinery can now separate whole blood into its life-saving components while it is still flowing from the donor. This on-the-spot processing prevents enzymic action that causes blood to break down, and may thus make it possible to keep blood fractions fresh much longer (see PS, Sept. '51, p. 147).

The portable fractionator, a pilot model, has been developed by Dr. Edwin J. Cohn, of Harvard, and by engineers of the American Optical Company. Blood flowing from the donor's veins goes through a tube that first removes calcium to prevent clotting. The blood is then cooled and enters a rapidly spinning centrifuge that separates the red cells from the plasma and automatically transfers each to its own sterile container.

Scorpion Shows Its Fangs

THE Northrop F-89 Scorpion, America's "basic defense aircraft," shows some of its stinging power as it unleashes three of the 16 five-inch rockets tucked under its wings. The Scorpion, whose armament was recently revealed for the first time (PS, May '51, p. 143), also carries six 20-mm. cannon. Twin Allison J-36 turbojet engines, side by side under the fuselage, power the 15-ton plane. Scorpions are now in service with Air Force units on the West Coast.

Felling timber hasn't been mechanized in the forests of the Austrian Alps. Here an old forester takes a sight along his ax handle to determine how a big spruce is going to fall.

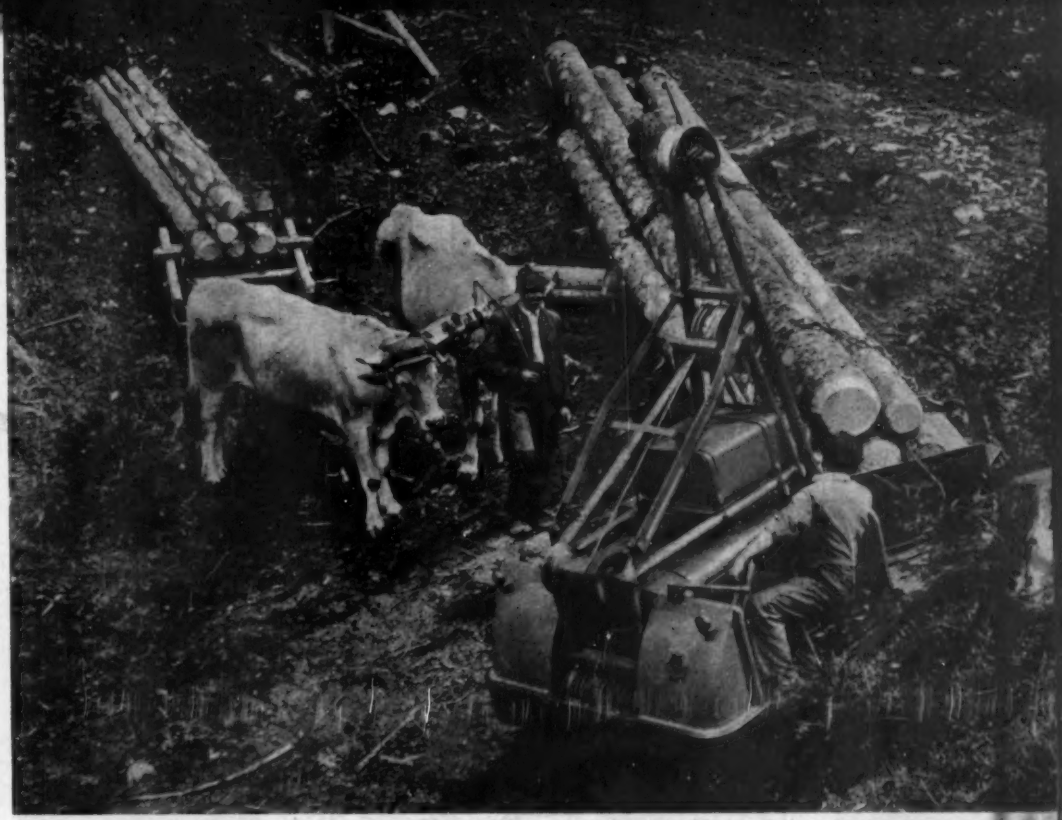
Power Mule Speeds Logs to Sawmill

EXPERT woodsmen of the Austrian Alps can fell a giant spruce in less than half an hour. But it used to be many months before the logs reached the nearest valley sawmill. That was before Oskar Hacker's Motormuli cut the time to a single day.

Engineer Hacker was appalled when he discovered that Austria's backward timber industry left spring-felled trees lying on the mountainsides until winter, when they could be slid down on the snow. An obvious job for tractors, he thought. But ordinary tractors were too heavy and wide for winding, roadless Alpine slopes, so he sat down to design one for the job. Some 2,000 drawings later he had what he wanted. Local manufacturers, however, didn't want what he had. Then a representative of the U. S. Economic Cooperation Administration saw his plans, put up the money, and Hacker's Motormuli was born.

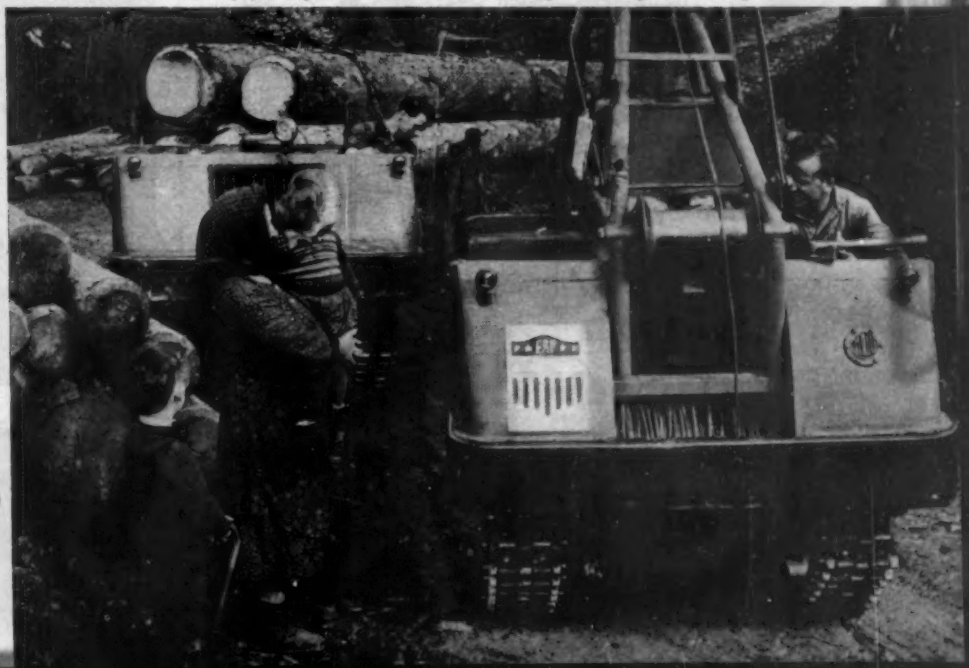
Trimmed logs are chained together for loading. Previously, timber cut in spring would wait for winter snows to be slid down mountain slopes. Oxen helped part of the way.

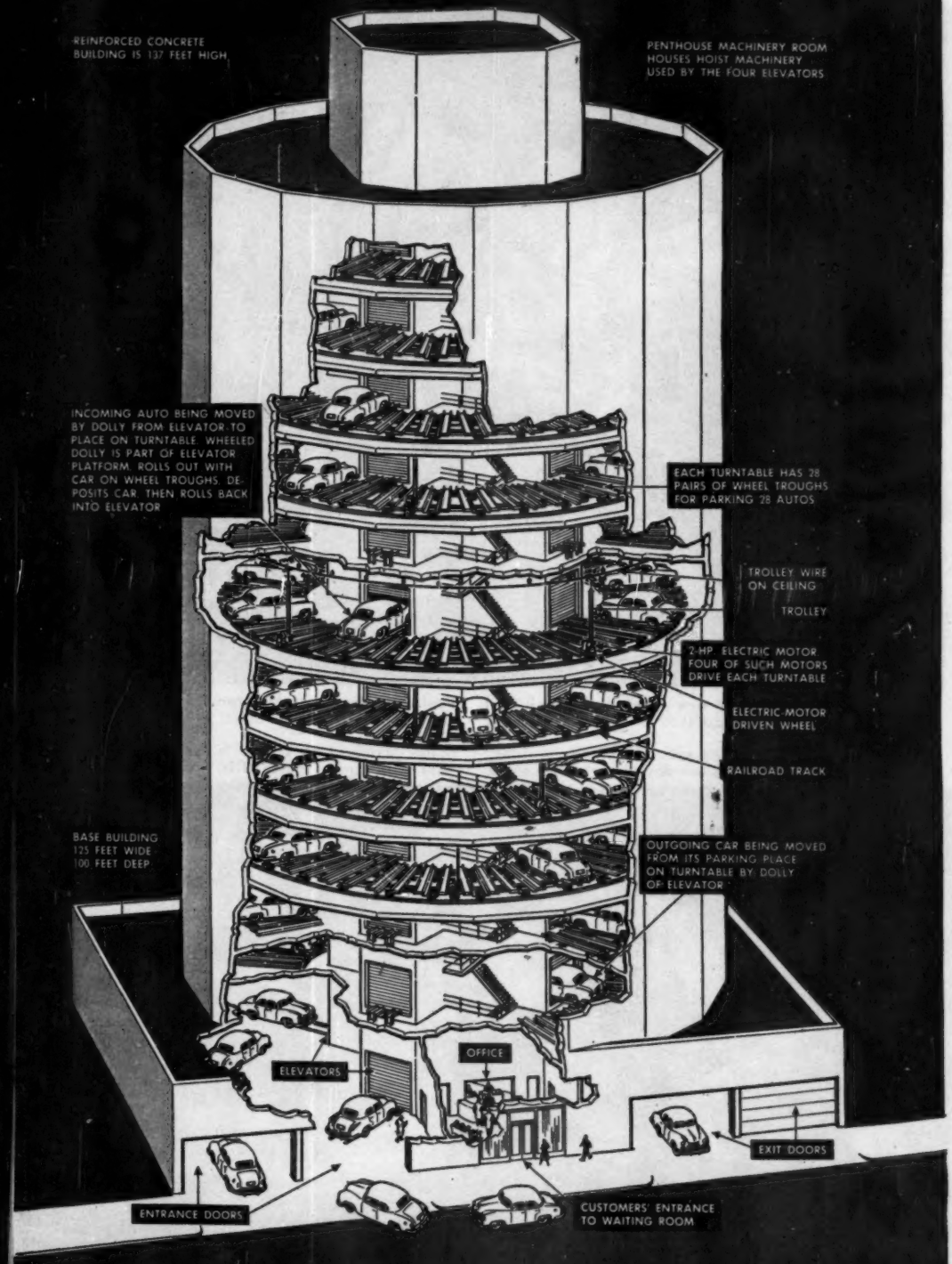
Built-in winch pulls log load onto trailer. Most of load weight is dragged. A turntable, rotating on a spherical joint, enables tractor unit to negotiate tortuous mountain trails.



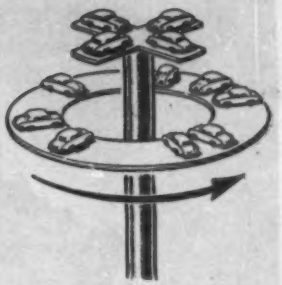
The old and the new meet. Note small load behind oxen compared to five tons of logs being hauled by the 3⅝-ton Motormuli. Diesel engine is a four-cylinder 60-hp. Steyr.

Village audience greets Motormulis at valley destination after a one-day journey from forest timber stands. Rear tractor is smaller version, with two-cylinder engine of 26 hp.




REINFORCED CONCRETE BUILDING IS 137 FEET HIGH
PENTHOUSE MACHINERY ROOM HOUSES HOIST MACHINERY USED BY THE FOUR ELEVATORS
INCOMING AUTO BEING MOVED BY DOLLY FROM ELEVATOR TO PLACE ON TURNTABLE. WHEELED DOLLY IS PART OF ELEVATOR PLATFORM. ROLLS OUT WITH CAR ON WHEEL TROUGHS, DEPOSITS CAR, THEN ROLLS BACK INTO ELEVATOR
EACH TURNTABLE HAS 28 PAIRS OF WHEEL TROUGHS FOR PARKING 28 AUTOS
TROLLEY WIRE ON CEILING
TROLLEY
2-HP. ELECTRIC MOTOR. FOUR OF SUCH MOTORS DRIVE EACH TURNTABLE
ELECTRIC-MOTOR DRIVEN WHEEL
RAILROAD TRACK
BASE BUILDING 125 FEET WIDE 100 FEET DEEP
OUTGOING CAR BEING MOVED FROM ITS PARKING PLACE ON TURNTABLE BY DOLLY OF ELEVATOR
ELEVATORS
OFFICE
EXIT DOORS
ENTRANCE DOORS
CUSTOMERS' ENTRANCE TO WAITING ROOM

"Merry-Go-Round" to Park Cars



IF YOU'VE ever wheeled 'round and 'round the block searching vainly for a place to park your car, where Sam Spade himself couldn't track down a spot big enough for a junior-grade scooter to squeeze into, take a look at this. It's the Rotogarage, latest answer to the parking problem in traffic-jammed city streets.

This multi-story automatic parking tower, its designers claim, could accommodate 400 cars on a plot 100 by 125 feet—seven times as many as a parking lot of that size. Rates will be about the same.

Here's how the Rotogarage works: The parking floors are turntables, stacked like a platter of pancakes on a central column of four elevator shafts. You drive in on the ground floor, stop your car in front of one of the four elevator doors, cut the engine and get out.

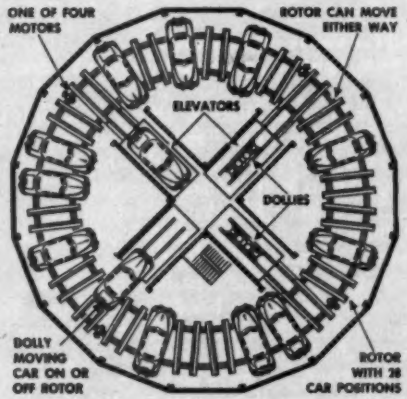
A dolly emerges from the elevator, lifts your car a few inches off the floor and pulls it into the elevator, which carries it up to one of the rotor floors that has an empty slot on its turntable. While the car is rising, the turntable is rotating to present its vacant spot in front of the elevator door.

The elevator stops and the doors open, turning on a floodlight. The dolly runs your car out and deposits it on the turntable. If another auto has been called for, the elevator takes it down on the return trip.

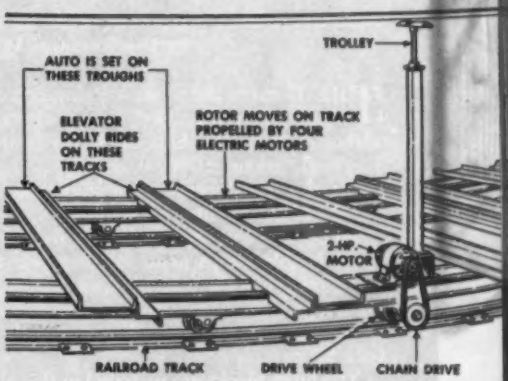
Average elapsed time from the opening of the elevator doors to receive a car until the car is stored and elevator returns to ground floor: one and one-half minutes.

Since its construction conforms to the standards of the Federal Civil Defense Administration, the Rotogarage would also serve as an effective bomb shelter in case of atomic attack.

Towers are being planned, by Rotogarage Parking Units Co., for New York, Boston, Washington and Philadelphia. END.



Floor plan shows method of operation. Rotor, encircling four elevators, stores 28 cars, with three more in dead space between elevator shafts.



Rotor revolves on tracks, chain-driven by four electric motors mounted on outer rim. Each motor is powered by a trolley stick that rides against an overhead power line.

Italy and England are the main sources of genuine alabaster, from which the base of this lamp was made. It was imported from Italy by the House of Italian Handicrafts, Inc., N. Y. C.

Television Lamps Dug from Ancient Mine

Alabaster, the translucent stone so valued for vases and statues by the Romans, is now being put to an up-to-the-minute use.

THE Romans didn't have television in mind when they first began digging alabaster from the hills in Staffordshire, England, some 2,000 years ago. They made the translucent white stone into a variety of ornaments and statues.

Today the soft stone is being used for special table lamps good for their warm, soft glow when the television set is turned on. Helps you keep your eye on Junior when he wants to shoot TV cattle rustlers with his new air rifle.

The huge blocks are quarried in this old mine under a hill honeycombed with mine galleries since Roman times. Carefully worked from the rock face, they are moved to the factories where the blocks are sawed into more manageable shapes.

The smaller chunks can be turned on lathes as easily as wood and can be cut, sawed, ground and polished.

The fragile stone is easily scratched and needs some care in handling, but finished articles of alabaster—book ends, lamps, lamp shades, clocks, powder bowls, cigarette boxes, ash trays and a host of other products—are safely sent through the world today as alabaster has been for centuries.

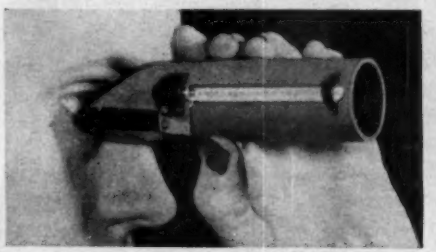
At the factory freshly mined alabaster blocks are sawed into convenient sizes. The stone can be sawed like wood but needs a little more patience. The smaller, more easily handled pieces then go to the workshops to be carved or cut into shape.

A circular saw, tipped with Carborundum and bathed with water, cuts the stone into slabs. The workman is holding up a fresh-cut slab to the light to show its translucence and brown veining. Some alabaster is pure white, and it all has a "light" appearance.

You can turn alabaster on a lathe. This "Kerver" or carver has been at it for 40 years, shaping the stone into hundreds of designs. Many of the lamps reproduce the designs of ancient Greek vases. The white dust is gypsum, ot which alabaster is one form.

Stretched Steel Is Stronger

BOTH these metal sheets contain the same amount and quality of steel, but the latticed one is stronger, remaining rigid even while bearing the combined weight of a man, the solid sheet and a block, as shown above. Made by slitting and stretching solid steel in a press, it is said to gain increased strength from the vertical slant of the thin ribbons. Wheeling Corrugating Co., Wheeling, West Va., developed the sheet.



Water in Honey Measured

THIS new pocket-size refractometer helps the honey tester tell at a glance the amount of moisture in a sample without referring to conversion charts. The instrument, made by Bausch & Lomb Optical Co., Rochester, N. Y., measures how much light rays bend when passing through the honey. This varies directly with the water content of the sample.

Robot Golfer Never Misses

THIS golfer's form is perfect—it never varies an inch. He's Oscar, a mechanical robot designed by Clifford H. Landis of Chicago to demonstrate the perfect golf swing in slow motion. Hips, shoulders, arms and head turn in perfect time, driven through shafts from a motor in the base.

Jets Get Sleek Fuel Tanks

THE long, sleek object suspended from the plane wing above isn't a bomb. It's an ultramodern auxiliary fuel tank, designed to cut down wind resistance in the Air Force's high-speed jets to an absolute minimum. Made of aluminum, the three-section tank is held together by a tie rod that runs from the bullet nose to the tapered tail. Length of the tank's center section varies according to individual flight requirements.

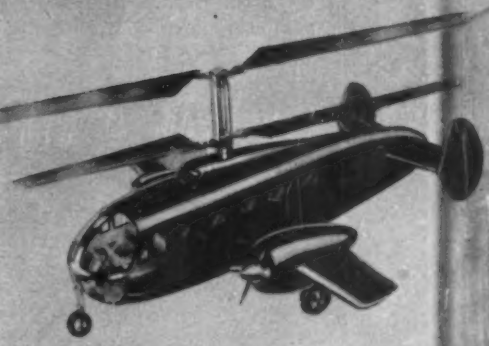
Here Comes the Convertiplane

Experimental Helidyne at left has no wings, depends on rotor blades for lift even during forward flight as an airplane.

THE Helidyne is an early bird in its field. While three manufacturers are working on Air Force contracts to design a convertiplane, the Gyrodyne Company of America went ahead and put just such an aircraft in the air. It takes off straight up as a helicopter, switches in mid-air to forward flight as an airplane, then reconverts to a 'copter for a vertical landing.

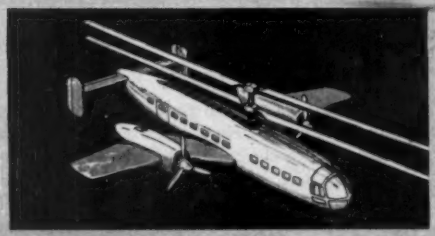
They did it by simply sticking an engine driving a conventional propeller on either side of a helicopter fuselage. Coaxial helicopter blades carry the Helidyne straight up to gain altitude and provide some forward speed. Then the propellers gradually take over forward thrust, giving the craft greater forward speeds than it could attain as a pure helicopter.

The Helidyne shown at the top of the page is admittedly experimental—but it has flown, and brings another old aviation dream closer to reality.

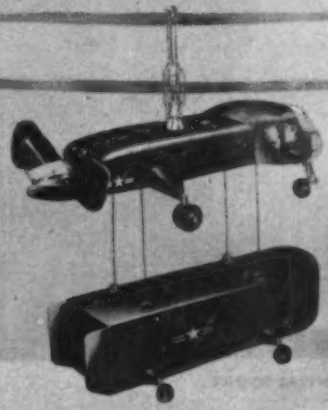


Model on drawing board has stub wings added. In fast forward flight they will take over full lift while rotor blades are locked.

Helicopter transport below hovers while winches raise a cargo pod into position from the ground. It may have a convertiplane version.



Convertiplane liner of future may carry over 50 passengers at speeds greater than 350 m.p.h.



How They Make

Shotgun Shells

Exacting manufacture, step-by-step inspection and endless research pay off in take-it-for-granted performance.

By Kendall W. Goodwyn

CACKLING like an outraged spinster, a big pheasant flushed from the tall grass and started to take off like a Thunderjet for the wild blue yonder. The hunter's gun came up fast and smooth, leading the gaudy game bird just enough to let him fly into the shot column, and *wham!*

"Nice shooting, Ed," said the other man as the ringneck went into the bag.

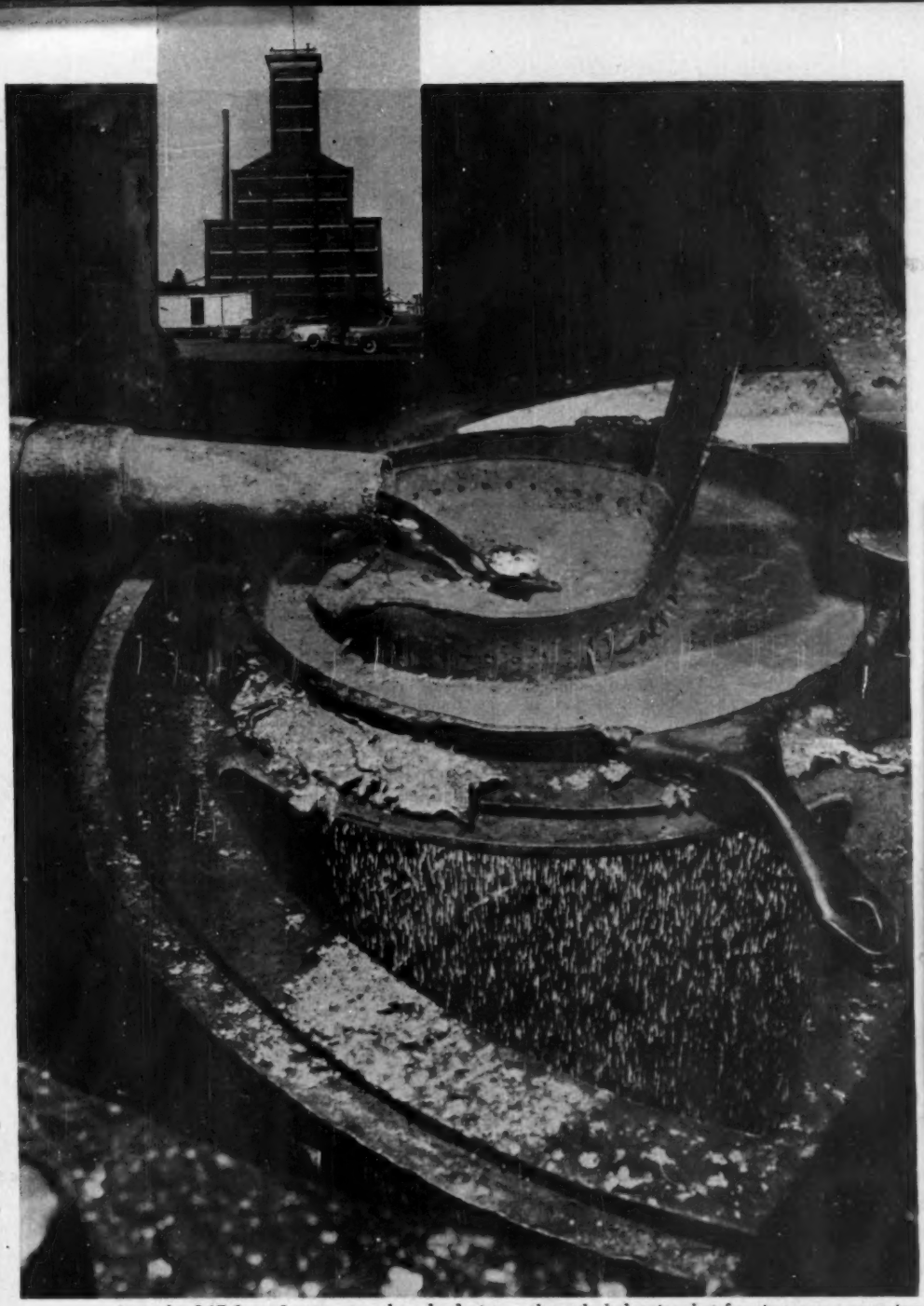
"Thanks, Jim," Ed grinned. "I'll give the gun a little credit—and," he added, slipping in a fresh shell, "this ammo is okay too."

The fact is, modern shotgun ammunition is so *darn* good we rarely stop to think about it. Hold a shot shell in your hand and it looks pretty simple. Brass head and paper body—primer on one end, the other heavy with shot. But that simple-appearing item contains 14 components which are made and assembled in an intricate manufacturing process requiring 212 operations.

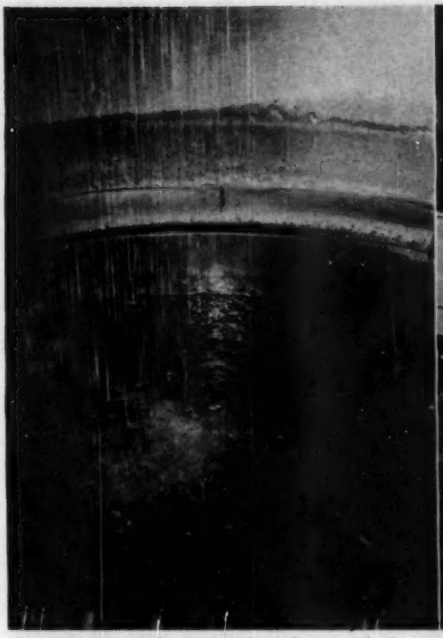
Let's visit the Bridgeport, Conn., plant of the 135-year-old Remington Arms Company —where they turn out 1,800,000 shotgun shells a day—and get an idea how it's done.

Shot Making Carefully Controlled

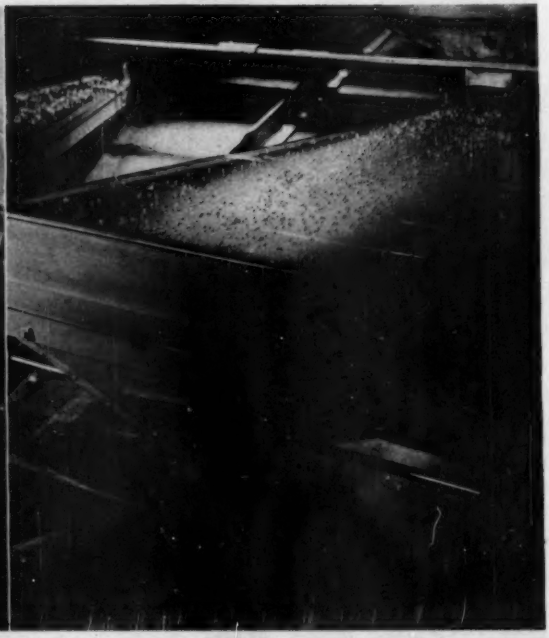
The shot tower is a good place to begin. Strangely enough, they still make shot much as they did in the days when George Washington loaded his fowling piece for a little wingshooting—by pouring molten lead through a sievelike gadget that looks like one of your wife's frying pans and dropping it down a shaft to give it time to cool and



Atop the 167-foot shot tower, where lead pigs are melted at 700° F., molten metal pours through holes in shot-forming pan, emerging as round pellets already beginning to harden.



"Leaden rain" drops 133 feet down a shaft to lower floor of tower, is caught in a tank of water that cushions its fall.



Perfectly round shot roll over these tilted glass plates fast enough to skip a gutter that traps lopsided ones for remaking.

harden. Today, however, the ingredients and subsequent steps are precisely and scientifically controlled.

Tower supervisor Arthur Hiertz—a keen-eyed Remington veteran who's been on the job here 41 years—explains that the proper proportions for chilled (hardened) shot are approximately 95 percent lead, four percent antimony and one percent arsenic. The antimony does the hardening and the arsenic gives the mixture the right surface tension.

The rough shot is screened for roundness, sorted for size, and polished by whirling it in drums containing graphite. Then it's stored in vats ready for use. They make around 532,000,000 shot here in one day.

Machines Are Almost Human

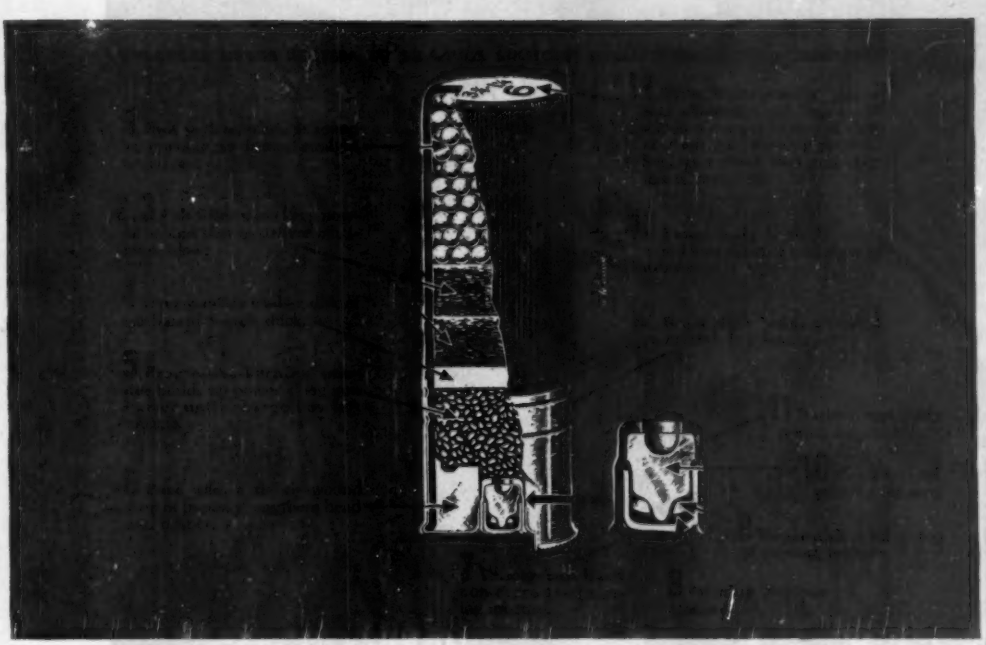
Meanwhile, in another building, the paper body, the brass head, the five parts of the primer, and the wads and powder are being prepared for assembly into the shell.

The base wad is punched into the body and the brass head fitted on. The primer—the shell's "spark plug"—is assembled (a touchy business because of the highly explosive priming mixture) and inserted. Now the partially completed shell goes to the loading machine—a complex tribute to man's mechanical genius—which in one series of operations measures and pours in the powder, adds the filler wads, weighs and feeds in the shot, crimps the open end of the body into a six-way star, irons it flat and seals the shell with a nylon-waterproofed paper disk.

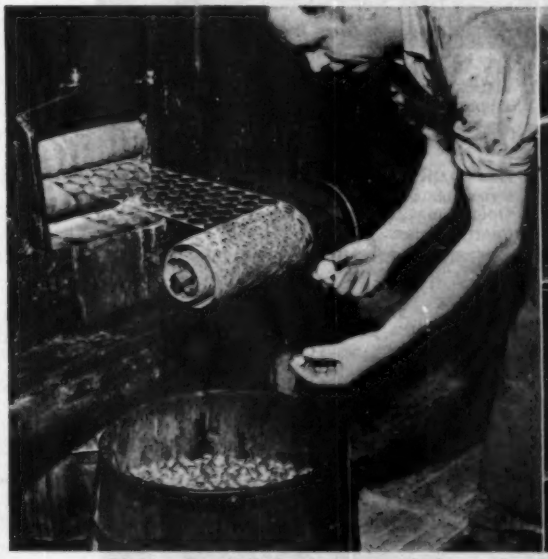
Shells Get Rough Treatment

All through manufacture, the shells are under close scrutiny, both visual and mechanical. Heads are automatically measured by passing them under a height gauge; powder charge is checked by a plunger that probes into each shell and stops the machine if the load is off as much as five grains; samples of every lot of completed shells are cut open for loading inspection. And in Remington's ballistics division, shells are fired and tested under far stiffer conditions than they will ever encounter in the field.

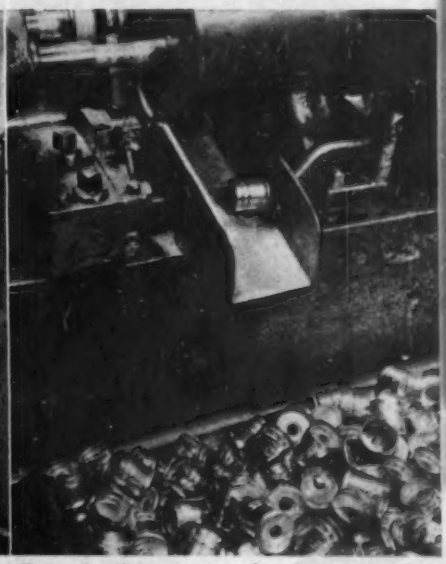
That's why when you draw a bead on your favorite target, whether it's pheasant or partridge, canvasback or clay pigeon, you can count on your ammunition—sure as shooting!



Term "gauge" for size of shotgun shell goes back to time when the diameter of a one-pound ball of lead was one-gauge. Thus, diameter of 12-gauge shell (shown enlarged above) is same as that of one of balls formed by dividing pound of lead into 12 equal spheres.



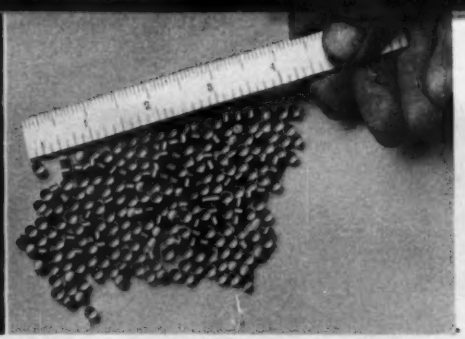
Blanks for shell heads are punched out of a roll of brass and formed into cups. Next steps in processing are trimming, polishing, flanging and embossing.



Brass head comes out of embossing machine all finished except for final trimming of flange. Then it's ready to be fitted onto shell body.

(Continued on next page)

Paper for shell bodies is cut, stamped with Remington imprint, rolled and pasted into long tubes. Razor-sharp disks in cutting machine slice tubes into five body lengths.



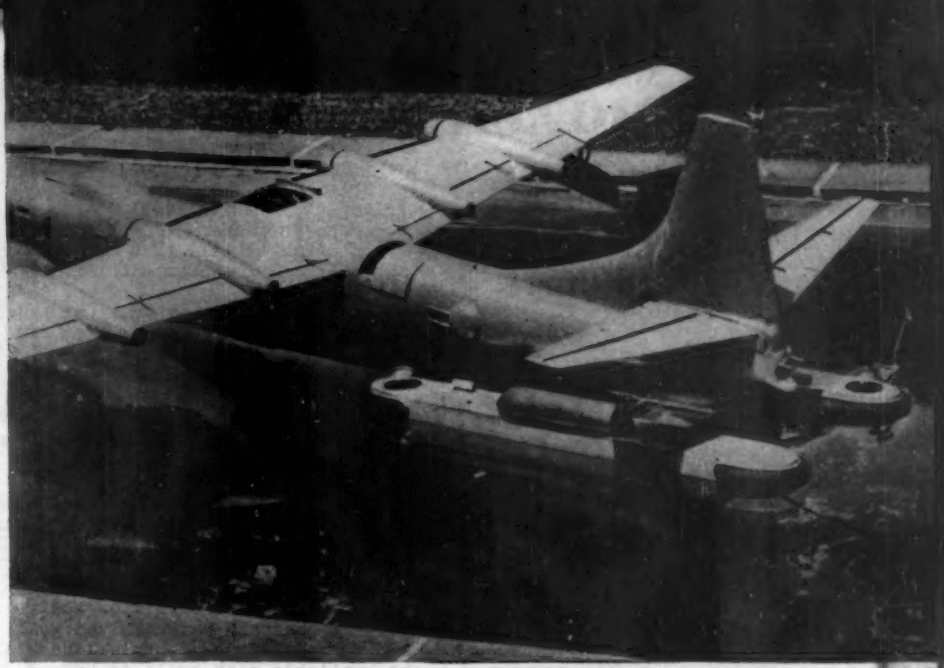
These are the tiny primer cups, which are punched and processed much like the brass shell heads. They hold the priming mixture which explodes on impact of firing pin.

Two filler wads of felt go into each shell on top of cardboard over-powder wad. The springy felt acts as a piston, pushing shot out of gun barrel when shell is fired.

It's done with mirrors. Inspectors examine bodies, heads and primers—inside and out—as partially assembled shells pass along a conveyor system.

In ballistics lab, shells are fired on fixed "guns" to check velocity and function. Pattern is rated by counting number of pellets hitting 30-inch circle.

Last stop. Final inspection and packing ends series of 212 operations. It all leads up to Operation 213—that split-second when the hunter squeezes the trigger!

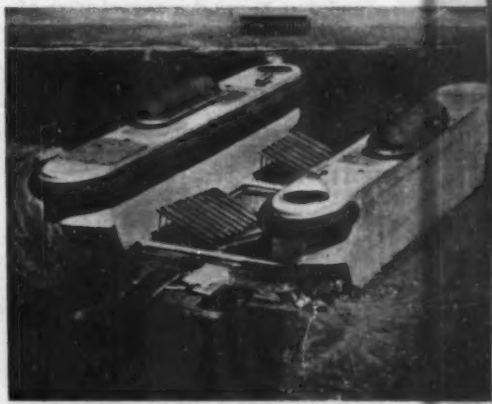


Twin flotation chambers are flooded so dock can move in under plane. Pneumatic bumpers protect flying boat from damage at all points of contact. Hull rests on removable pallet.

Dock Walks Off with Seaplanes

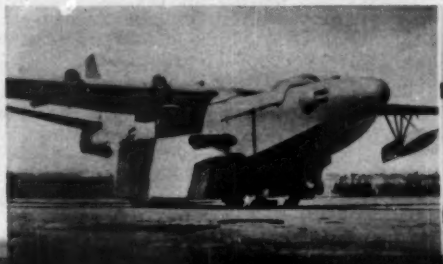
A SEAPLANE dry dock that can submerge itself, move backward, forward or sideways, and crawl up sandy beaches on tractor treads promises to simplify the tricky handling of giant flying boats.

Each of the two pontoon-like floats has a propeller—mounted at the opposite end from the other—that can turn through 360 degrees to give complete maneuverability. There are three tractor treads mounted in tricycle fashion, and two control stations, either of which can operate the Edo Corp. unit. These photos, made with scale models, show how the dock would beach a P5Y, Convair's fast new turboprop seaplane.



Floating dock has two propellers and three tractor treads to give land-or-sea maneuverability. At diagonally opposite ends of flotation chambers are cockpits for helmsmen.

As helmsman approaches shore, he transfers power from propellers to caterpillar treads. One of two large pneumatic cushions can be seen raised under wing to support it.



V-shaped removable pallet on which hull rests is transferred on its wheeled gear to an unloading platform. In actual operations, this would be done by means of winch or tractor.

P.S.

Last minute news & notes...

ABOUT 2,500 NEW RADIO HAMS qualified for licenses in the first five weeks after the FCC lowered requirements for new amateur operators. Most of the applications came under the Amateur Novice Class that was set up to help beginners get on the air more quickly. Applicants need only pass a simplified examination and a five-word-a-minute code test. Novice licenses are good for one year and are not renewable.

GAMMA RAYS from a $7,000-an-ounce metal--thulium, one of the rare-earth elements--are being used in England for X-ray-type pictures of aluminum castings. Irradiated in an atomic furnace, thulium gives off rays of just the right length. Most rays are too penetrating.

NEWEST GLOBAL BOMBER, eight-jet version of the B-36, is expected to make its first test flight late next month. This swept-wing YB-60 will be powered by eight Pratt and Whitney J-57s, each developing 10,000 pounds of thrust . . . BRITISH claim their latest jet fighter, the Hawker P-1067, is the fastest in the world, superior to both the F-86 and the MiG-15.

FIRST PLANE designed to act as a tanker aircraft, troop transport, cargo carrier or hospital plane has been delivered to the Air Force. Called the KC-97E, it's the newest modification of Boeing's Stratofreighter . . . NEW HYDRAULIC FLUID for the Navy can be spurted into the flame of an oxyacetylene torch without catching fire. Called H-2, it's made by R. M. Hollingshead Corp. Flammable fluids have caused several air accidents.

LOOK for one of the major automobile producers to announce a gas-turbine bus in the next couple of years. It's in the works. Popular Science forecast just such a development a year ago last summer (PS, June '50, p. 98) . . . GENERAL MOTORS may follow Chrysler in using power steering on passenger cars. Detroit reports say it will be on some 1952 GM models. . . . TINTED WINDSHIELDS can be added to any car by applying a colored-plastic filter strip. It sticks to the glass by itself. Filterzone Auto-Vision Co., Brooklyn, makes it.

COAST-TO-COAST TV became a reality last month when the Bell System completed its transcontinental microwave network in time to put the Japanese peace-treaty negotiations on the first nation-wide television hook-up.

UHF TELEVISION is still a year or two off, but sets built to receive the new channels have arrived. All models in the new Motorola line will be available with built-in UHF tuners. Opening of the ultra-high frequencies to commercial telecasting is expected to add some 70 new channels to the present 12 VHF (very-high-frequency) bands, making possible more and better distributed TV services.

THE NAVY may be planning to atom-bomb a submarine. It has asked Congress to let it use a partly finished submarine as a target for "underwater explosions."

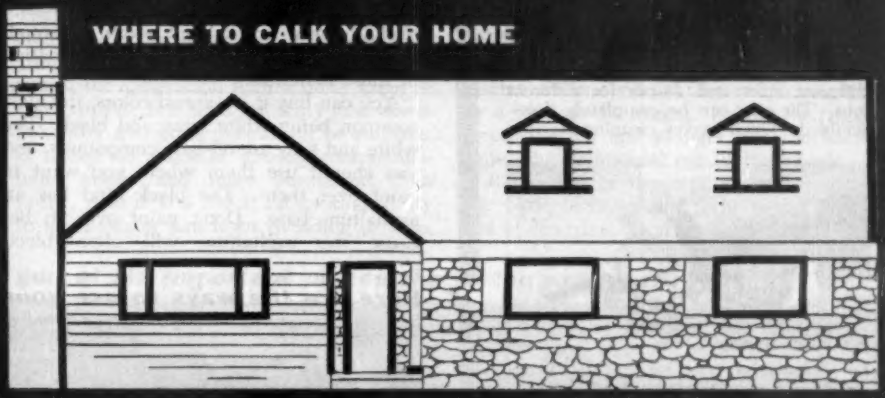
DIESEL FUEL made from oil shale at Rifle, Colo., (PS, Feb. '49 p. 130) has come through a use test with flying colors.

THREE SYNTHETIC pain killers may help the fight against drug addiction. Demerol, methadon and dromoran do morphine's work, but don't give the "kick" to addicts, and are easier to control, being factory-made . . . NEWS on synthetic cortisone is breaking fast. Latest: Merck & Co., Inc. says it can make it from substances found in such abundant materials as yeast, Mexican yams, soy beans, cattle spines and wool fat. After process is perfected, it will mean more cortisone.

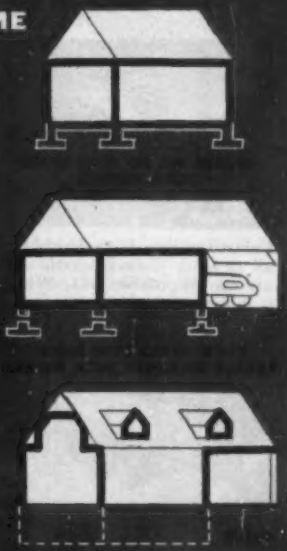
The Editors

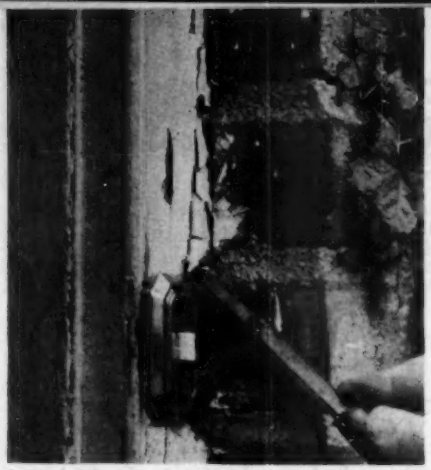
MECHANICS
and
HANDICRAFT
REG. U. S. PAT. OFF.

WHERE TO CALK YOUR HOME

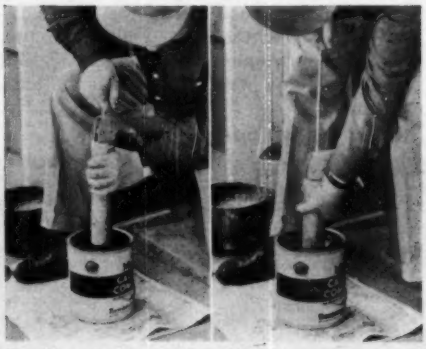


WHERE TO INSULATE YOUR HOME





Calking needs replacing when it looks like this. Scrape out all calking that is cracked, crumbling or loose. Old chisel is good tool.



Loading bulk compound. Remove cap and nozzle. Push plunger all the way into barrel. Put end of barrel in compound (left). Pull back on plunger (right) letting gun down into can as compound is sucked into barrel. Wipe off excess compound from outside of barrel.

To clean gun, run out all remaining compound and wash gun with solvent. An old paintbrush will help you wash plunger and threads.

perature is lower than 55° F. or when the surface is the least bit damp. When the temperature is too low, the compound becomes too stiff to work properly. It won't dry and hold as it should.

When painting your house you can calk at the same time. You don't have to wait for calking compound to dry before painting over it. If you are doing a two-coat job, apply the first coat of paint. Let it dry, calk, and then go ahead with the finish coat. It's best not to calk over raw wood. Prime it first.

How to calk. If you find loading bulk compound is a messy job, use a calking cartridge. This is a cellophane tube with compound inside. You drop it in the barrel and snip the end off with scissors.

You'll notice that nozzles of the guns are beveled. Hold the gun so the angle of the bevel is parallel with the joint to be calked.

Pump the trigger once or twice until compound starts to ooze out of the nozzle. Move the gun slowly and steadily along the joint, squeezing the trigger as you go. As the ratchet clicks, release the trigger and start the slow, steady pressure on the trigger again. Keep the nozzle moving along evenly all the while.

Where to calk. Check around window and door frames and other openings. Scrape out all calking that is cracked, crumbling or loose. Remove calking that has shrunk so it is pulling away from the wall or frame. If you can slide a knife blade between calking and wall or frame, then the compound has started to pull away. After scraping out old calking, dust out the joint with an old paintbrush.

If old calking is sticking firmly at the sides but has started to crack down the center, then it is generally safe to re-calk over the old compound.

Windows and doors. Calk completely around window frames. Also fill any joints in the frames that may have opened. If you have steel casement windows, calk all around them too. Then go inside and seal the joint where the steel frame and the plaster meet. Use the smaller ¼" round nozzle or the pinched nozzle for the inside job.

Around door frames, carry the calking down to the spot where the frame meets the stoop. Also calk wherever a stoop, porch floor or sidewalk meets the house.

Exterior walls. If these walls are wood siding, fill all cracks and seams, using the

smaller round tip. If the walls are brick, fieldstone, stucco or other masonry, use the ¼" round tip. Scrape out loose or cracked mortar and replace it with calking compound. Water that seeps into masonry joints may freeze and crack the masonry.

Roofing and flashings. Reload your gun with black, asphaltum-base compound for calking the roof. The black compound is best for roof jobs because it stands up better under exposure to the sun than the white or gray compound.

Check around all chimney flashings, calking where necessary between the metal and the brick work and between the metal and the roof. Other spots on the roof that may need calking are around vent pipes and along the flashings in valleys. Also run a bead along the eaves where the shingles overhang.

Wherever you have to fill wide joints—such as on a flat roof covered with roofing felt—use a putty knife or trowel to apply the black compound.

Cleaning the gun. Run any remaining compound out of the gun. Then disassemble the gun and wash all parts in mineral spirits. Use a piece of wire to clean the tips. Make sure the threads on the barrel and cap are clean. An old paintbrush is handy for washing the threads and the end of the plunger. When the parts are clean, assemble them and wrap the gun in a cloth.

Plastic-base compound is made for filling cracks around bathtub, shower, sink, or joints in tile. No gun is needed. Just squeeze the tube.

While ordinary compound and a calking gun can be used to seal joints in tile and cracks around a bathtub, there is a plastic-base waterproof compound for this purpose now on the market. It comes in a tube and you apply it by squeezing the tube. It dries in four to six hours.

INSULATING Your Home for More Comfort

MOST houses built in recent years have been at least partly insulated. A lot of older ones haven't been insulated at all. The chances are that, unless you live in a new, lavishly built house, additional insulation will improve your home.

What to expect. Good insulation is like money in the savings bank: it pays a regular interest in unconsumed fuel. How much it pays is tough to figure in advance, depending as it does on a lot of variables. You should be realistic in estimating the probable savings. Don't total up five different advertising claims and expect the fuel bill to dwindle to the vanishing point, like the character who bought so many gas-saving gadgets he expected to bail out the tank of his car every ten miles.

However, here's what a full insulating job can do: A six-months' test was recently run in Belleville, N. J., on two identical two-story homes. One was fully insulated and the other only above the upper ceiling. Over the period of the test, it took 340 more gallons of fuel oil to heat the incompletely insulated one than it did the other. At 12 cents a gallon, that's a six-months' saving of $40.80.

Blowing it in. If the walls of your house weren't insulated when the house was built, and if you want to fill them, probably your best bet is to call in a professional. His crew will arrive with a truck, big blower, long hoses and bags of insulation. They will remove sections of siding, cut holes in the sheathing, blow in the insulation, and seal up the wall. If you have a lot of time and energy you might do the job yourself, but it is laborious and tricky. One problem is locating the fire stops, the short, transverse two-by-fours between studs. To do it right, you should cut a hole just under each fire stop, and this calls for a lot of sounding and probing.

Unless you are very ambitious, better not tackle a blowing-in job for an entire house. It isn't too hard, though, to do a limited area, say, a bathroom with one cold outside wall that makes the room a bit chilly for comfort. Insulation can be fed into wall holes with scoops bent up out of dustpans.

Don't forget that if you can couple the

You can install any of these kinds of insulation

Blanket: This is a fibrous material sandwiched between paper. Rolls are different lengths and widths. Among materials used are mineral wool, wood fibers and cotton.

Loose fill: Available as pellets of expanded mica (vermiculite) or as loose fibers. The latter may be slag wool, rock wool, glass wool or shredded redwood bark. You just pour it in place.

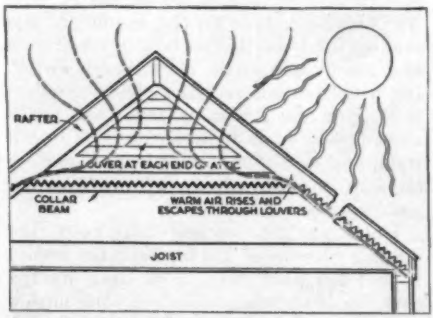
Insulating board: These rigid boards—some of them decorative—are made of vegetable or wood fibers. They often are used as finish walls and ceilings. The decorative ones are called tile and plank boards. Some are nailed in place. Others are put up with clips or special adhesive.

Reflective: This is a bright metal foil, usually aluminum. It comes in long lengths and is just wide enough to be stapled between studs, joists or rafters.

Batts: Similar to the blanket type, but in the form of pads that are just long enough to be handled easily and wide enough to fit between studs, rafters and joists. In some, the insulation is glued to a sheet of treated paper that acts as a vapor barrier. Others are enclosed between two sheets of paper, one of which is a vapor barrier. They can be stapled in place.

wall-insulating job with remodeling work, you can get inside the wall more conveniently. For instance, if an outside plastered wall is to be covered over with paneling or wallboard, it will be easier to forget the outside, siding-and-sheathing approach and just cut into the plaster at the ceiling and at the fire stops.

Insulating the attic. Here the job is much simpler, and unless you're very lazy, there's no need to call in a pro. About the only tools you need are your hands, and the only cost is that of the insulation itself.



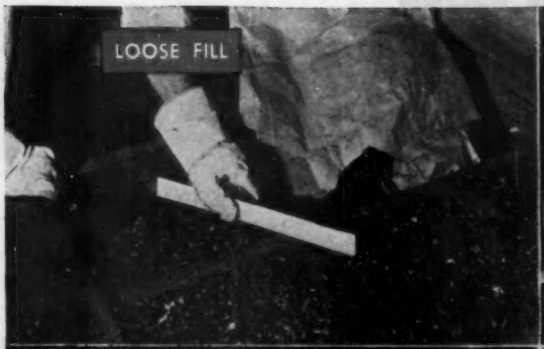
Roof insulation keeps your home warmer in the winter and cooler in the summer. It keeps heat from escaping during the cold months. In summer, heated air flows away through louvers.

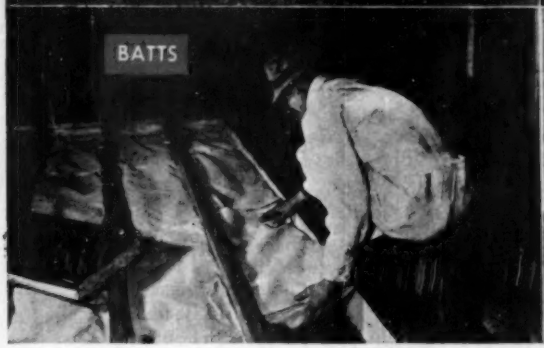
Where the attic is not floored but has just walkways on the joists, it's simply a matter of lugging the insulation upstairs and putting it between the joists. Bags of loose fill are bulky, and you may have some trouble getting them up narrow stairs or through a small hatchway. If there's a fair-sized attic window, it's often easier to rig up a pulley from the roof overhang and haul the stuff up.

A plastered ceiling between the joists must be treated gently, of course, since it won't take much of a load. It's a good plan to cleat together a platform of boards to stand on so that you can slide it along the joists as you work.

Work with an old hat on because it is often a dusty job and you are also apt to konk yourself on the rafters. And if you put in loose mineral wool, work with gloves—the material may irritate your hands.

If the attic flooring is nailed down, you aren't necessarily prevented from putting





insulation between the joists. Often the boards are really subflooring, put in carelessly and not thoroughly nailed to the joists. If that's the case, it isn't much of a job to pry up six or eight boards, put in the insulation, replace the boards, and move on.

Installing your insulation. If you use batts or blankets in your attic, lay them between joists and staple them between studs and rafters. Loose fill, of course, is poured.

Reflective insulation should always be installed with an air space—at least ¾"—on each side of it. As soon as reflective insulation is placed where its face touches another surface, it loses efficiency. The metal foil then conducts heat.

Foil insulation can be stapled on the edges of framing members, but it's better to staple it between them. Then if you later decide to finish your attic, you can nail up wallboard and the board won't touch the foil.

When installing any insulation, remember to follow the maker's directions closely. His insulation is made to be installed in certain ways. Follow his instructions and you'll get the best results from your work.

Ventilation. This is a must, especially for summer comfort. Keep the air moving out from under the roof as it heats up and the heat won't have a chance to transfer to the rooms below.

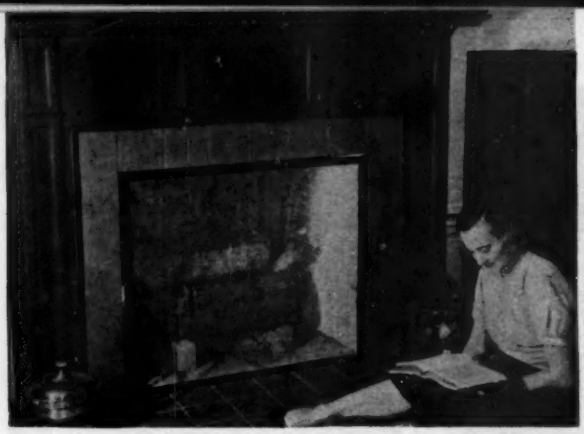
When you're insulating between the rafters, start at one side where the rafters meet the joists. Don't carry the insulation all the way to the roof peak. Run it across between the collar or tie beams and down the other side to the joists.

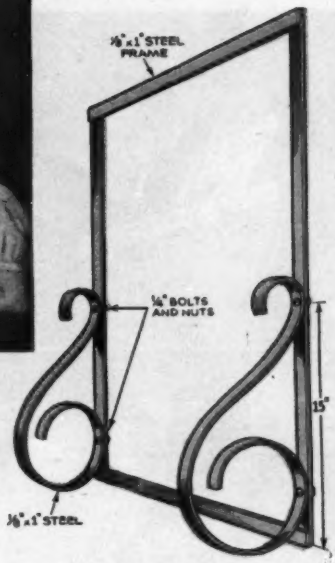
For ventilation, install louvers at each end of the attic. Place them as high up as you can get them. They must be above the collar beams and the insulation.

While you're about it, see to your storm sash and weather stripping. Neglecting these two safeguards is like locking the barn after the horse is gone. A lot of the heat saved by insulation and calking can be lost through loose-fitting windows and doors.

END

Bargains from house wreckers: You can save real dough on doors, windows, bath fixtures and many other things by buying them secondhand. See PS next month.





Iron Fire Screen Built in One Evening

You can turn out this practical fireplace accessory with just a handful of tools, even if you've never hammered a rivet.

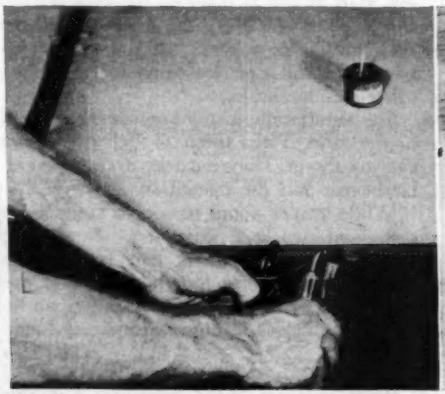
YOU don't have to be the village blacksmith, complete with anvil and forge, to build this metal fire screen. I did it with ordinary tools and less than $3 worth of material in about three hours.

After I hacksawed the four frame members to length to suit my fireplace, I squared them and clamped them together. Then I soft-soldered each corner. The ¼"-mesh hardware cloth was stretched over the back of the frame and spot-soldered.

The use of soft solder on a fire screen may sound risky. But it has worked okay for me because the fireplace heat isn't intense enough to melt the solder and because the screen conducts the heat away fast.

However, if you prefer, you can use rivets to fasten the frame corners and hold the cloth to the screen.

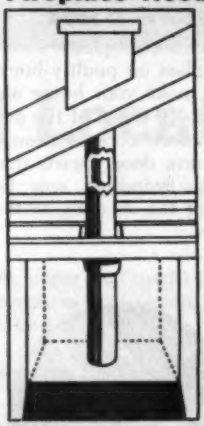
To finish the screen, I painted it black and then antiqued it with gray-green glaze. —*John Rogers, Dallas.*



Screening was stretched evenly across the back of the frame, clamped and spot-soldered at intervals. An alcohol torch proved handy for this.

Feet were bent from ⅛" flat steel without heating. A vise and a claw hammer did this job. Feet should be riveted or bolted to the frame.

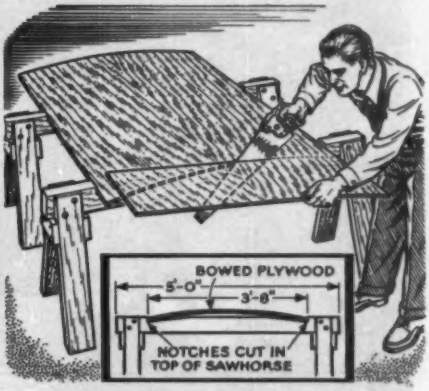
Fireplace Needs No Masonry



HERE'S a real wood-burning fireplace, complete with hearth and chimney, that can be bought "off the shelf," carried in and installed without tearing up the house for costly masonry work.

The Hearthplace and prefab chimney can be set up in a day's time, according to the maker, LaSalle Products Inc., Elkhart, Ind. The chimney housing on the roof is galvanized sheet steel. Fireplaces for flat-wall or corner use are obtainable in genuine mahogany, walnut, birch and knotty pine.

Saw Horse Helps Cut Plywood



BECAUSE craftsmen often buy plywood in less than full-sheet sizes, one lumberyard uses special saw horses to hold the sheets for cutting. Each horse is about 5′ long, with a notch cut in the top about 3′8″ long. The plywood is bowed to fit into the notched section, which holds it tightly, cutting down vibration. The sawing can then be done without difficulty.—*G. E. Hendrickson, Argyle, Wis.*

Enamel Covers Dark Finish

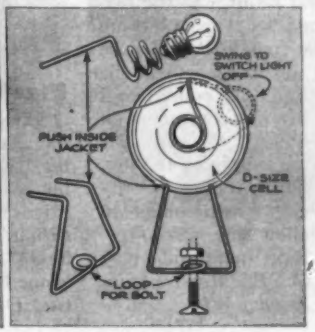
WITH a new enamel trio you can apply a blonde or limed-oak finish right over a dark-wood finish without even sanding. It's good on natural woods, too, where the grain is unattractive. A ground color is applied first, followed by a graining liquid and a clear finish. N-B Enamel Paint Co., Union City, N. J., makes it.

Lighted Jack-o-Lantern Is Safe

A LIGHTED pumpkin safe for the youngest kids can be made with a flashlight cell and bulb, two paper clips, a bolt and a nut. The dry cell will last for a whole evening of fun.

Straighten both clips. Bend one around the bulb base, leaving a straight leg that can be pushed into the cardboard jacket of the cell, with the bulb on the center contact. Swing it aside to turn the light off, as shown by the dotted lines.

Shape the other clip into a foot. Push both ends into the cell jacket. Punch a hole in the bottom of the jack-o-lantern and bolt the foot down through the bent loop at the bottom.—*H. Walton.*



Pipe Bender Shapes Furniture

MODERN kitchen, porch and lawn furniture can be made by the home craftsman with the aid of the tube bender pictured above.

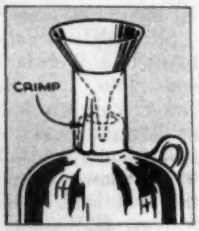
The tool, originally designed for plumbing and electrical work, makes smooth bends in 1" steel, iron, brass or aluminum tubing. It is made by Holsclaw Bros., Evansville, Ind.

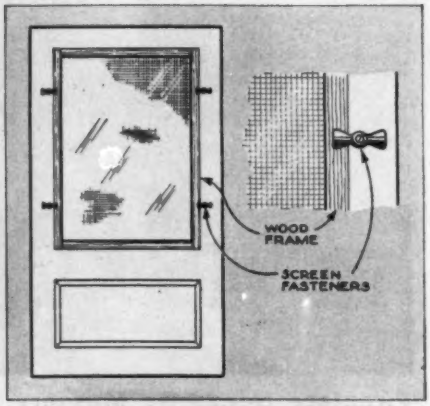
Nail Set Removes Wallboard

IT'S sometimes necessary to remove a section of wallboard when remodeling or repairing. Prying it loose may damage it. A better method is to drive the fastening nails all the way through the board with a nail set. When replacing the board, fill the holes with plaster.—*A. Yaw, Seeley, Calif.*

Tin Can Helps Fill Jugs

IF YOU have to fill a number of jugs, you can save time with this setup. Cut the bottom from a tin can and set it over the jug opening to receive the funnel. It will raise the funnel, allowing air to escape as the liquid is poured and insuring a rapid, even flow. If the can rests too snugly on the jug, put a crimp in the edge with pliers to allow the air to escape more quickly.—*G. E. Hendrickson, Argyle, Wis.*



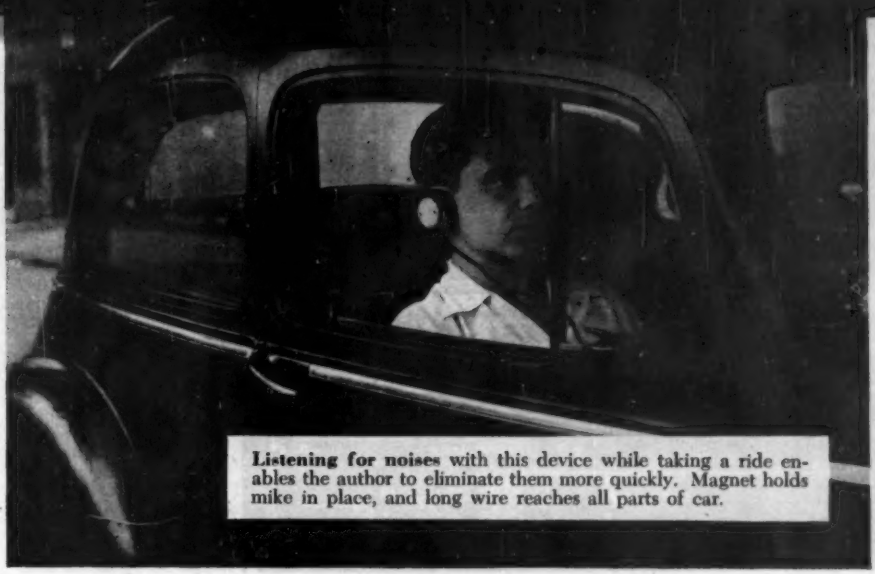


Plastic Glazes Storm Doors

THE wire- or cord-reinforced plastic sheeting used in place of glass on poultry-house windows can help to make your house airtight this winter. A framed panel of the material, attached to a screen door as shown, will convert it to a storm door. Drafts that leak in around cellar windows can be blocked out by tacking the sheeting to the inside of each window.

Plastic Strip Seals Casement

FLEXIBLE vinyl channeling for sealing a metal casement window against drafts, water and dust is sold in 38" lengths and can be cut to fit with ordinary scissors. Tiny ridges molded inside the strip grip the metal casing. The added lip at the top (shown in inset) presses firmly against the window frame to make a tight seal. Draftite Products Co., Dayton, Ohio, makes it.



Listening for noises with this device while taking a ride enables the author to eliminate them more quickly. Magnet holds mike in place, and long wire reaches all parts of car.

I Locate Rattles with a Stethoscope

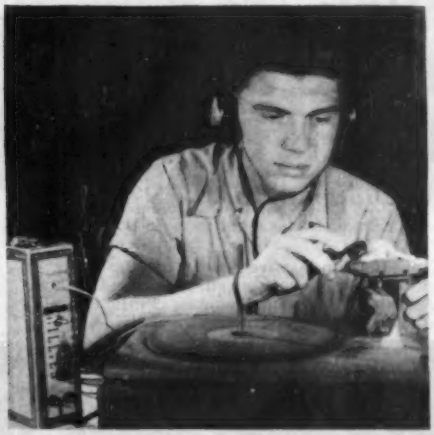
My cigar-box outfit is better than a doctor's for the job. A mike picks up sound, transformer makes it louder.

By David Findlay

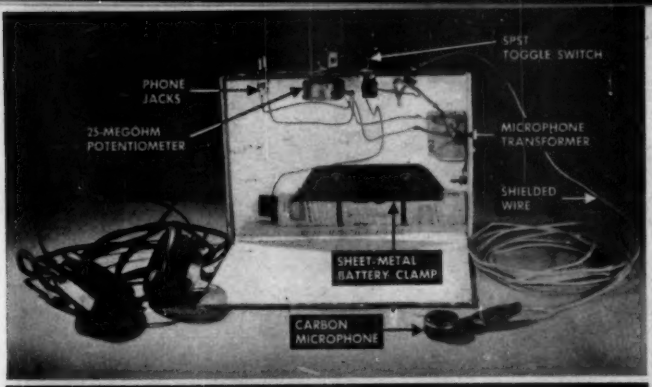
EVERYBODY loves a quiet car. But any mechanic will tell you squeaks and rattles are harder to find than a mosquito in your bedroom.

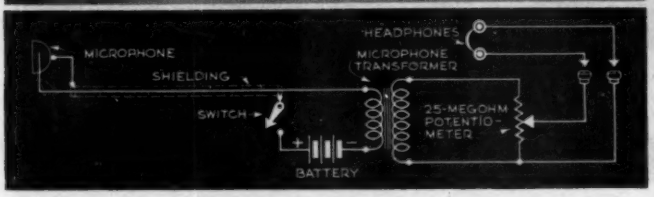
My homemade electric stethoscope makes

Engine knocks can be found too. Moving mike around on cylinder head picks out a slapping piston. Connecting rod knocks are loudest if mike is shifted to bottom of motor block.



Other uses. The 'scope will spot trouble in such household items as record changers, fans, vacuum cleaners. Hidden water pipes can be traced by turning on water, following sound.





Stethoscope parts are housed in a cigar box. Power comes from three 1½-volt flashlight cells clamped between two sheet-brass contacts. As in a radio, the potentiometer provides volume control, a help in such spots as a worn transmission where sound level is high. A "pot" of the value shown was found to give best results. Stethoscope will work well, however, without a volume control. Connect transformer output wires directly to phone jacks.

finding the cause of noises a lot easier. It can be assembled for peanuts from a few parts available in radio or electrical stores. A surplus throat microphone, bought for less than 50 cents, picks up the noise, but any carbon mike could be used. A doorbell transformer works well if you can't get a mike transformer like the one I used.

The assembled unit works like a doctor's stethoscope, but a 15′ wire enables you to listen from any seat in the car, a big help when you're tracking down a rattle or squeak that appears only when the car is in motion.

Front-end, steering and spring noises can be found by driving the car over a bumpy road with the microphone attached

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Here are tips to help you silence car noises after you've found them.

Why Drive a Rattletrap?

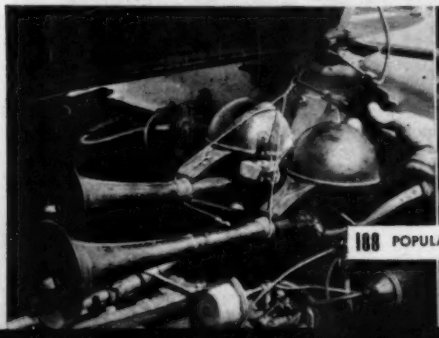
By Clinton R. Hull

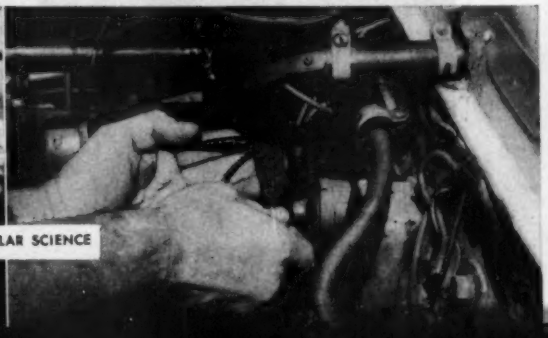
MOST squeaks and rattles in your car are easy to get rid of—once you've located them. Put a screwdriver in one pocket, a roll of tape in another, grab a grease stick in one hand and an oilcan in another—and you're ready for the villains.

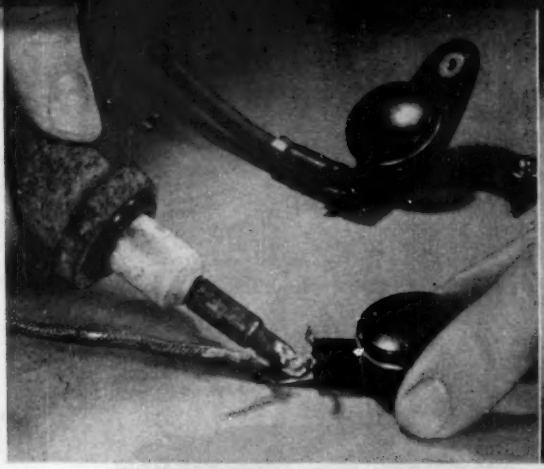
You can lick nine out of 10 noises with just this simple equipment. The photos and drawings on this and the next two pages give some suggestions on how to proceed—but remember that your own ingenuity counts too.

Twist-tension a wire bridle to stop rattle of horns mounted on firewall. Tape and lacquer bridle to improve appearance. Bridle can also be used to support muffler or tailpipe.

Tape cables and wires together in sets of two or more under hood and behind instrument panel to cut down cricket-like chirps. Tape, grease or wax at friction points also helps.





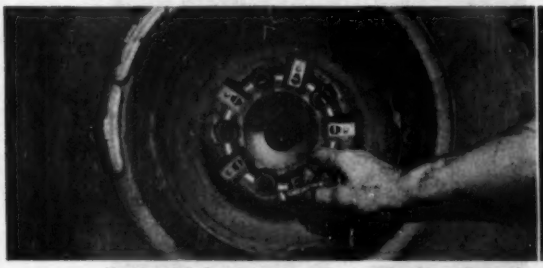


Microphone originally had two pickup heads. Since only one is needed, they were separated by cutting through rubber connecting strip. In center of this you'll find a wire and a steel strip. The shield of the transformer lead was soldered to the strip, the wire to wire (above, left). Alnico magnet is taped to mike head (above, right) for remote listening while car is in motion. Sounds are transmitted through magnet to the mike. Magnet isn't needed in close-up work.

to different parts of these assemblies. A loose bumper part will be almost inaudible when the microphone is attached to the hood or fender, but will sound off clearly when attached to the bumper.

When the microphone is placed on the side of a transmission or rear end, broken or chipped gear teeth will show up. The rattling sound that indicates worn bearings can be heard—you can even tell which bearing is at fault by placing the microphone over the position of each.

Moving the microphone over the motor will show the position of a knock, and the condition of the water pump, generator or distributor can also be determined.



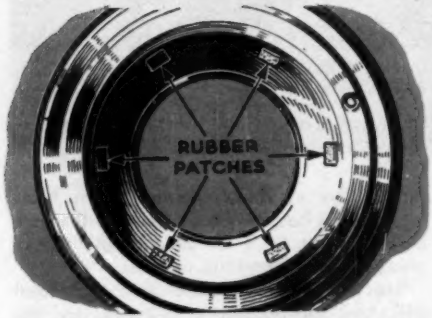
Lack of lubricant may cause wheel creaks and door noises. Apply stick wax to door striker plate and contact surfaces of wheel and drum. Use light oil on door hinges, latch mechanisms.

Sponge-rubber ball cut in half and inserted as shown will help deaden hood vibration. Rubber weather strip (arrow) can be applied where hood hits cowl if new hood lacing is needed.

Rubber striker buttons, shimmed up or replaced, may help eliminate door noises. To compensate for latch wear, loosen striker-plate screws and reset plate. [*Continued on next page.*]

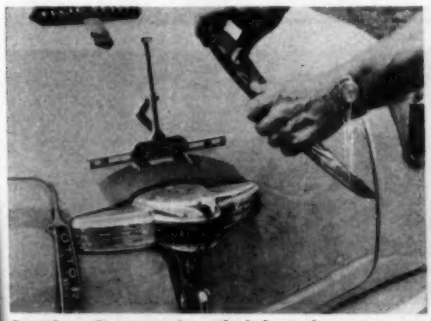
Trunk-lid mechanism is guilty of many squeaks and rattles. Oil, grease or wax stops squeaks in counterbalanced springs, spring rods, folding deck supports or latch. Tightening bolts or hinge rivets and increasing spring-clip tension on lid arms checks most rattles. If gasket has shrunk, loosen hinge bolts (left) and adjust lid to seat properly.

Bits of rubber or tape jammed into cracks (right) tighten up loose sections of the grille.



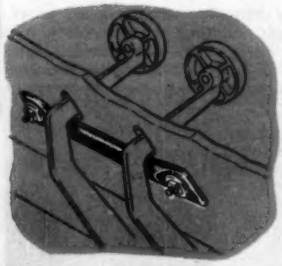
Large wheel disks can be kept from squeaking by cementing several rubber patches on inside surface where disks rub against the wheel.

Vibration rattle in a floor starter pedal can be eliminated by stretching a weak spring from the upper part of pedal shaft to the firewall.



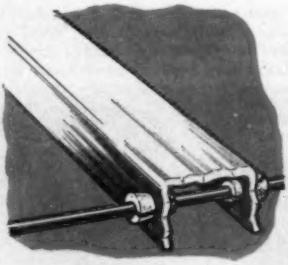
Bending license plate slightly and mounting it in straight frame will usually keep it quiet.

Wrap tools in several folds of cloth. Cement felt padding to inside of glove compartment.

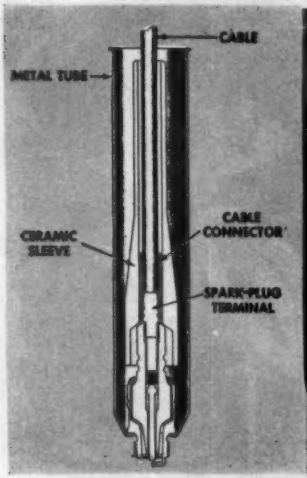


Rubber hose screwed in place as at left will keep pedal bars from slapping the underside of floor boards when you lift your foot. Be sure to maintain free clutch travel or it'll slip.

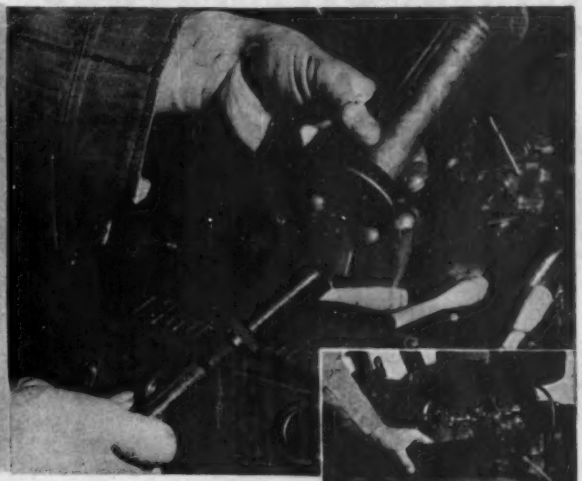
A cork, drilled, split and slipped over a fuel line or cable where it passes through metal part of car is a good replacement for a rubber grommet that has worn out or deteriorated.



Servicing New Deep-Well Spark Plugs



Chrysler V-8 spark plugs rest inside metal tubes that go into cylinder-head wells. Ceramic sleeve surrounds cable connector and plug terminal to prevent flashover to metal tube.



Socket wrench reaches into tube to remove or replace plug. Note ceramic sleeves on wires above. A metal cover (right) shields the wells from dirt and moisture. Screws hold it in place.

CHRYSLER's new V-8 engine introduces a spark-plug installation that requires new servicing techniques. The plugs are at the bottom of deep wells in the cylinder heads.

Wires are removed from the plug terminals by grasping the ceramic sleeves and pulling straight up. The sleeves must be handled gently to prevent chipping. To unscrew the plug, a 13/16" thin-wall deep-socket wrench is inserted into the well. A metal cylinder comes out with the plug.

When plugs are replaced, a torque wrench should be used to turn them up to 30 or 32 foot pounds. This is an important step since standard compressible gaskets are not used.

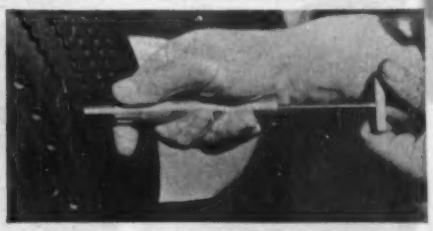
Ironing Pad Handy in a Car

NEXT time the ironing-board pad in your home is replaced, rescue the old one. It does a fine job as a noise-stopping wrap for car tools. And when you have to crawl underneath, it will keep your clothes clean.

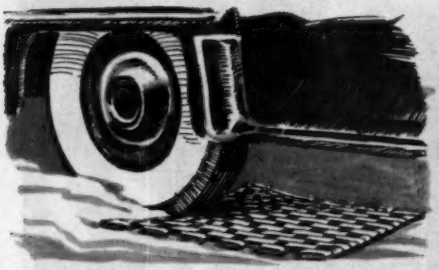
Gun Shoots Patch into Tubes

PATCHING a puncture without removing the tube from the tire sounds like wizardry, but that's what a new rubber-shooting repair gun does, according to the maker, Notz-Sweney Co., Englewood, Colo.

Once the nail has been pulled out, the tip of the gun is placed on the hole and the handle turned. This is said to seal puncture holes in both tube and tire.

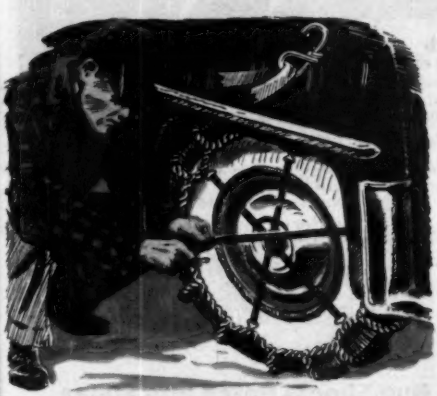


Winter Driving Aids You Can Make



Mat for Traction. Cut a rubber-link door mat in half, store the parts in the trunk, and you'll be able to get going again when you're stuck.

Ballast. If your car needs ballast in back to improve traction on slippery roads, ram thick cement mortar into an old tire. Tire is easier to put in or take out than sandbag, cleaner too.



Chain Tighteners. Cut three bands 1½" wide from an inner tube. From heavy coat-hanger wire, shape two hooked fasteners for each band (see detail above), bending looped ends around band. Stretch bands across wheel and hook fasteners in chain.

Take-Apart Shovel. A long-handled shovel is best when you have to dig your car out. A shovel adapted as shown above will fit into the trunk.

Windshield Scraper. Buy an 8" window squeegee at a hardware store and insert a 24" length of ¾" dowel. The long handle will let you remove snow without getting wet.

Undercoating Your Own Car

It's a thrifty job in two ways. You save the cost of having it done, and keep the body metal from rusting away.

By E. F. Lindsley

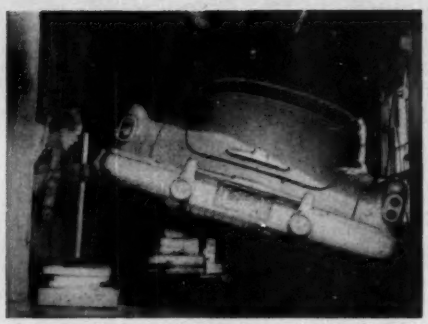
UNDERCOATING is an extra that an auto dealer often tries to load on when you buy a new car. But you need not dig into your pocket for this extra. You can do the job yourself at a total cost of around $6, and save from $25 to $40.

Undercoating has two advantages. First and foremost, it will protect a car by preventing the rust that eats through fenders and body. Secondly, sprayed or brushed into metal-to-metal cracks and crevices, the black asphalt material will forestall many a squeak and rattle.

Most people think of undercoating in connection with a strictly new car, but it's actually a job that pays dividends on one of any age. In fact, it offers a means of curbing rust that may already have gained considerable headway on a car six or 10 years old.

Remove rust. Whether the car is new or old, all rust must be removed and the metal cleaned off before the undercoating

Here's what you need—several cans of undercoater, a wide paintbrush to apply it, a jack, blocks, and brushes and trisodium phosphate to clean off all dirt and grease under the car. Trisodium phosphate is mixed with hot water.



Block up car rather than depend on jack. Lift car short distance, place blocks, get another bite with jack. Block car at two points—one forward under engine, second near rear. Canting car sideways lets you reach most points.

Tighten body and chassis bolts as a preliminary step. This is good insurance against rattles and squeaks later. Use torque wrench, if available, checking with service station for the body-bolt torque specified for your car.

goes on. Rust left under the coating would go right ahead with its damaging work. So work on the metal until it shines.

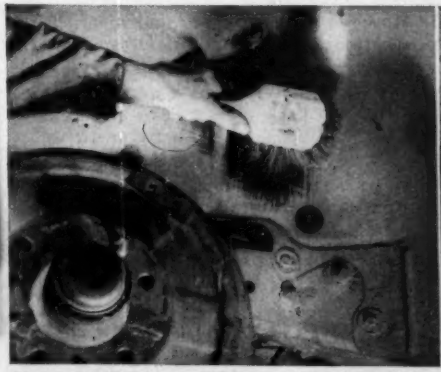
Where do you get the material? Retail stores of the big mail-order houses generally stock undercoating in gallon cans. This sells for around $1.40 a gallon. For the average car, four or five gallons will do the job.

In the shops, undercoating is usually sprayed on. For a single car, you can do it with a brush. The material goes on easily.

Cleaning comes first. I tackled my car after dirt, grime, oil, grease and road tar had been accumulating on the under surfaces for nearly two years. Getting this off is the most difficult part of the procedure.

Steam cleaning is probably the best way to prepare the car. If you can have this done reasonably, it'll save sweat. Instead, I relied on a wire brush (with an attached scraper), a fiber brush and trisodium phosphate to loosen up the grease. Trisodium phosphate is an inexpensive crystalline salt sold in hardware and paint stores for use as a water softener and cleaning agent. Mix it with hot water and daub it on oil and grease areas with a cloth or sponge.

In doing this job it's as important to know what not to coat as what to coat. Keep the material off moving parts of the clutch and shift mechanism, the grease fittings, oil pan, transmission, muffler and tailpipe, brake lines and connections, driveshaft, and rear-axle housing. Apply it liberally, however, under the fenders, on the frame and under



Clean off all dirt. Fiber brush makes short work of loose mud and sand (left). Clay and clinging soil need repeated soakings and hosings. Wire brush removes light rust. Scraper attached to it sweeps off clinging grease and oil (right), after latter areas have been soaked with a strong solution of trisodium phosphate. Steel wool, wire brush or a solvent will remove black chassis paint used on gas tanks and other parts of some cars. Ordinary black frame enamel does not require removal. Allow metal to dry well after cleaning.

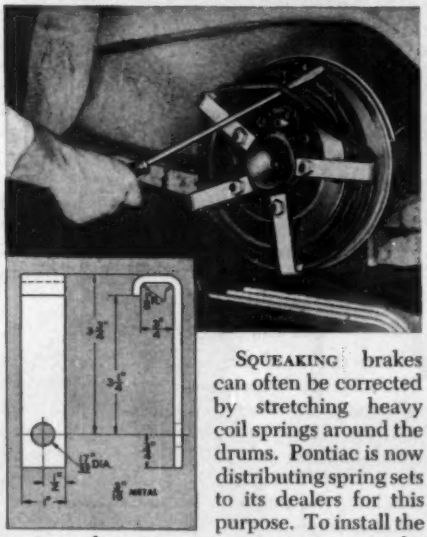
Brush on undercoater in an even, fairly thick coat. A thickness ranging from 1/16" to ¼" will be fine. If material needs thinning, gasoline or naphtha usually can be used. Apply it under fenders, on frame, floor, gas tank, inside rear bumper, on front and rear gravel deflectors and special fender panels. Hood is a good place to finish off job. Car can be driven within a couple of hours after coating, but overnight drying is better.

the floor. Under the fenders work it right out to the edge.

Play safe. To get under the fenders, you'll have to remove the wheels. Unless the support is very stable, remove only one wheel at a time. Take no chances with poor jacks or blocks.

Some undercoaters are inflammable while wet. So work with good ventilation—and avoid smoking and open flames. END

Springs Quiet Noisy Brakes



SQUEAKING brakes can often be corrected by stretching heavy coil springs around the drums. Pontiac is now distributing spring sets to its dealers for this purpose. To install the springs, four temporary retainers must be made as shown in the drawing and mounted under the wheel-stud nuts. These retainers are removed after the spring has been secured with small clips that come with the set.

Calking Fills Fender Line

TO LESSEN the chances of rust in the joint where the rear fenders meet the body in my late-model car, I filled the gap with calking compound (knife grade), smoothing it off even. I then let it dry for a week and applied touch-up enamel to the compound. The result looks like a welded seam.—*Frank Radden, Brooklyn.*

Disk Cuts Headlight Glare

CENTERED on a headlamp by three legs that clamp under the retaining ring, this new car accessory is claimed to break up glare from the center filament, with minimum light loss. It consists of a prismatic lens mounted in a chrome band. It's made by Abcone Die Casting Co., Detroit.

Gus and the

When stolen bank money begins to show up at the Model Garage, Gus turns detective—without a single clue but a temperamental lumber truck.

By Martin Bunn

"HIYA, Gus."

Gus Wilson looked up from a car radiator he was working on to see the tall, trim figure of a state trooper standing in the Model Garage shop doorway.

"Sergeant Jerry Corcoran," said Gus. "You haven't been by in months. Where the devil you been keeping yourself?"

"Making the rounds as usual," replied the trooper. "Only now I have to cover more miles and more cases—I'm driving a radio car these days instead of a motorcycle."

"Well, glad you finally found some free time to stop by for a chat."

"Sorry, Gus, but this is a strictly official call," Jerry said, grimly.

Gus cocked his head quizzically as he held a match to his pipe. "Can't remember that I've jumped any red lights or knocked down any old ladies recently."

Jerry Corcoran laughed. "No, Gus, it's got nothing to do with you personally, but I think you and some of the other merchants in town can help me if you will."

"Sure thing. What's up?"

Stolen Money Traced to Garage

"Remember that big bank robbery down in the city early this summer?"

Gus nodded. He remembered it only too well. At the time, the papers had been full of the story, telling how three men had forced their way into the City National Bank one night, cracked open the safe and made off with close to $80,000.

"Well," explained Jerry, "the Feds think that job was masterminded by the same guy who's pulled at least four other big hauls—all of them safe-cracking jobs. And what's more, the Feds have a hunch he's hiding out around here."

"How come?" asked Gus.

"Some of the money has been turning up in the daily deposits here at the bank—they know the serial numbers of most of the stolen bills. As a matter of fact, Gus, several have turned up in money you've deposited in the last few weeks."

"In *my* deposits?"

"Don't worry, Gus," Jerry grinned, "but it does mean that the guy we're looking for may be one of your customers. Been working on any strange cars lately?"

No Clues to Go On

"Now look, Jerry," said Gus, "you know as well as I do that all kinds of cars pull into a roadside garage. People stop for gas, they want their oil changed, they have a flat they want fixed. Sure, most of our business comes from the townspeople, and we know them. But every day we service dozens of cars we've never seen before."

"Yeah, I know," replied Jerry, "and the heck of it is that according to the flimsy descriptions we've got of this guy he looks just about like everybody else—no distinguishing features—just a Joe Doaks. All we're reasonably sure of is that he's about 40 years old and has dark hair. We also know that he does a pretty good disappearing act between heists."

"Not much to go on," said Gus.

"You're telling me?" Jerry groaned. "And he's all mine—to find, that is. The captain put me in charge of the case this morning. Said it would mean a citation, or maybe even a promotion, if I can come through."

Gus and Stan Check Bills

For the next few weeks, Gus and Stan Hicks, Gus's helper, paid close attention to all strangers who stopped at the Model Garage. They were leary of all bills and checked them against the list of serial numbers Jerry Corcoran had left with them. Luckily, the numbers fell into sets of continuous sequences so checking was largely a matter of memory.

More than once Stan or Gus thought they had a suspect—judging from a driver's looks—but each time the number on the bill failed to check and the suspect turned out to be no one more dangerous than a road-weary sales-

Missing Straddle Truck

Gus peered under the open hood while Frank maneuvered the big straddle around the mill yard, picking up lumber. Again there wasn't a hint of a miss.

— Ray Quigley —

man, a casual tourist, or a visitor in town on legitimate business.

But Gus and Stan continued to be suspicious of every driver of a strange car. Gus was in the garage office late one afternoon making change for Stan when he heard a car drive into the adjacent repair shop. Looking out through the open office door, he saw a blue pickup truck ease to a stop beside the repair bench.

"Never saw this truck before," Gus thought as he walked toward it.

Just then, the door popped open and a dark-haired man wearing a bright plaid lumber jacket stepped out.

New Truck Is Just a False Alarm

"Don Thatch," Gus called when he realized that the driver was the owner of the local sawmill and our biggest lumberyard. "That truck had me guessing for a moment. Didn't recognize it."

"It's new; bought it about six weeks ago," said Thatch. "Had to do something. That old one was falling apart."

"Satisfied with this one?" asked Gus.

"Pretty much," Thatch replied. "Right now, it's about ready for the final checkup and I'm hoping you'll be willing to give it a going over. It'll save me a long trip into the agency in the city."

"Do what we can," said Gus. "Any particular complaints?"

"Well, she's uneven as the devil when she's idling, but I know you'll take care of that. When can I have it?"

"Well, I'm near ready to close now. How about around noon tomorrow?"

"Swell, I'll have one of my men pick it up. Oh, by the way, could you stop out at the mill someday soon? One of the straddle trucks we use for hauling lumber is giving us trouble. The driver claims it's got a bad miss but the new handyman-mechanic claims there's nothing wrong."

Gus thought for a moment. "Tell you what, if we're not too jammed up here tomorrow afternoon when your man comes I'll ride back out with him."

Gus Meets an Odd Character

When Don Thatch's man showed up shortly after noon the next day, the pickup truck was ready and waiting.

"You riding back with me?" the man grunted.

"That's right. Understand Don's been having some trouble with one of his straddlers."

"Wouldn't know," the man grumbled as he raced the truck's engine impatiently.

The ride to the mill was made mostly in one-sided silence. Gus tried to make conversation, but when he found that all he could get out of the man were grunts, he gave up.

Don Thatch was just coming out of the door when the pickup pulled up in front of the mill office. "Glad you could make it, Gus," he said. "That straddle truck I told you about is parked over in front of the repair shop. Let's go around."

Driver Bears Watching

"Odd sort of character you've got driving your pickup," said Gus as he followed Thatch around the corner of the office building. "Does he ever say anything?"

"Don't know much about him," said Thatch. "Hasn't been on the payroll very long. Keeps pretty much to himself. Good worker, though, so I can't kick."

As they walked along, Gus made a mental note to let Jerry Corcoran know about the pickup driver.

The repair shack was a squat two-story affair and parked beside it was the big orange beetlelike truck with its engine and driver's seat perched high up on the four stiltlike legs that rolled on wheels.

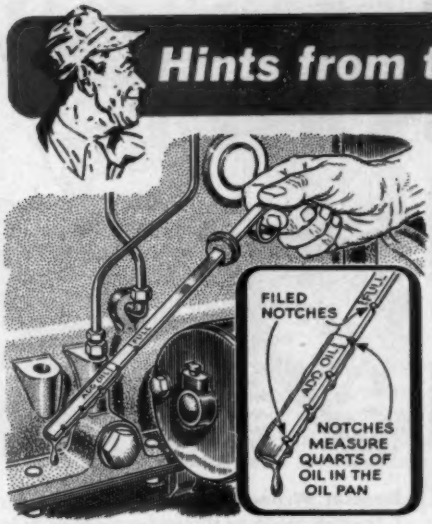
Don stuck his head inside the door of the building. "Ned," he called, "will you come out here for a minute?

"Meet Gus Wilson, Ned," Thatch said as a wiry, fair-haired man joined them. Then he added, "Well, I'll be getting along and see if I can locate the driver."

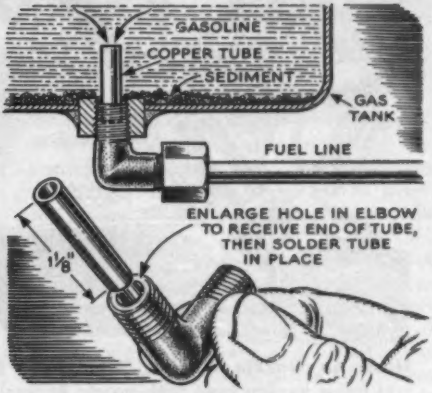
"Glad to meet you, Mr. Wilson," the fellow grinned as he rubbed his hands on the leather welder's apron he was wearing. "Mr.

[Continued on page 254]

Hints from the Model Garage

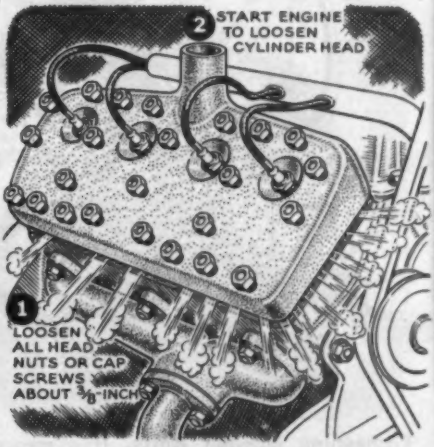


File Marks Measure Oil. Next time you change oil, add the new oil a quart at a time and file a mark on the dipstick for each successive level. Your stick will then give an accurate check in quarts.



Keeping Gasoline Clean. Trucks, tractors and older cars sometimes have the outlet at the bottom of the tank. A piece of copper tubing installed as shown above will help keep dirt from the line.

Testing Fuel-Gauge Tank Unit. You can check the rheostat in the tank unit of a fuel gauge by connecting it in series with a small six-volt bulb and then working the float arm. With the float in empty position, the light should barely glow. As you raise it, the light should steadily increase in brilliance.



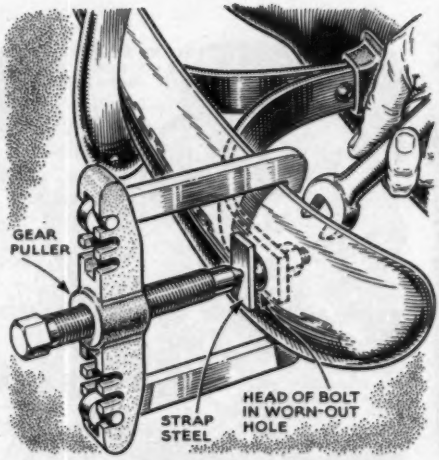
Blowing a Head Loose. Because V-type engines will run on one bank, there's a simple method to loosen stuck heads. Back off the bolts on one head about ¾", leave the spark wires connected, start motor, and head will blow loose. Then tighten this side down, back off the bolts on the other side and run the motor again.

Turn the page, please, for four more auto hints.

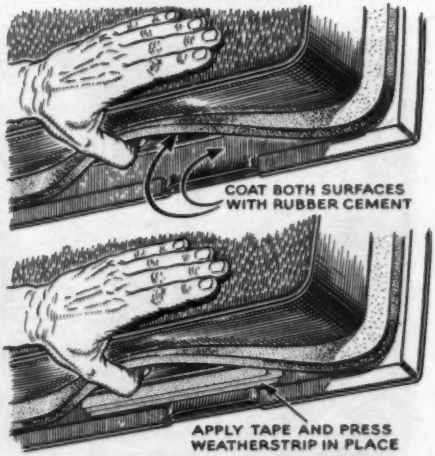
MORE Hints from the Model Garage

Hose on Nozzle Avoids Scratches. If you use a garden hose with nozzle to wash a car, the nozzle may slip from your hand and mar the paint. As a safeguard, slip a piece of radiator hose snugly over the nozzle. Turn this to adjust the spray.

Special Wrench for Head Nuts. A long T-wrench made as shown here can save lots of time in removing head nuts or cap screws on V-8 engines. Use one hand as a bearing for the shank and spin the handle rapidly with the other hand.



Tightening Bumper Bolts. If a square locking hole in a bumper has become so worn it won't hold the bolthead, assemble a two-jaw gear puller and a steel pad as shown here. (The pad keeps the puller shaft from chewing into the bolthead.) Turn the puller screw down tight and you'll be able to loosen or tighten the bolt as desired.



Replacing Weather Strip. When rust on the edges of a car door loosens the weather strip, try this. Coat both the strip and metal with rubber cement after brushing off the rust. Between the strip and metal, sandwich several layers of double-faced cloth adhesive tape (such as Bauer & Black Polyken No. 105). The strip will then hold.

How to Judge Used Power Tools

You have to look under the paint to spot quality. Here's the first of two articles on how to get a good buy when horse-trading for machines.

By Darrell Huff

LOOKING for a secondhand drill press, saw or lathe is like shopping for a used car. Just peering under the hood isn't enough. There are certain rather specific things you need to know in order to tell a sound bargain from a shiny lemon.

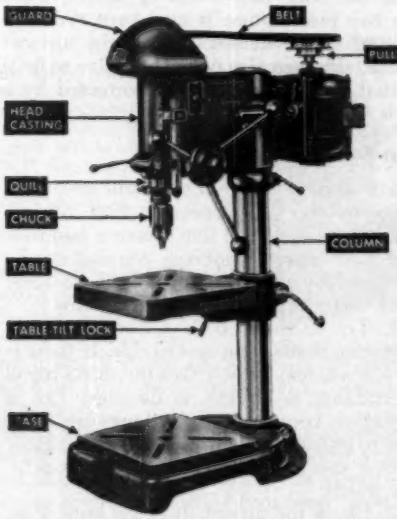
There are a few general points, too. The first is the name of the maker. Is he known for good tools? Is he still in business? There's nothing more annoying than owning an orphaned tool with a broken-down bearing that can't be duplicated.

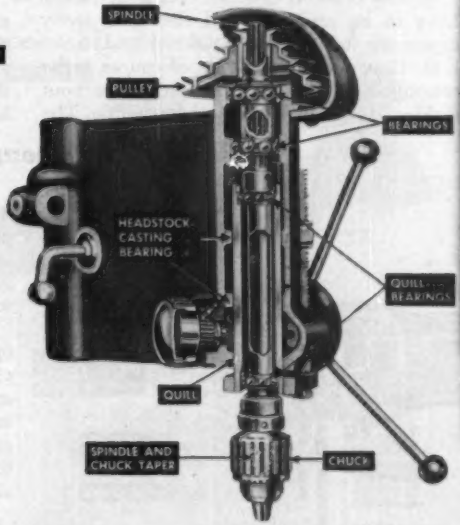
Note whether the tool is of the manufacturer's first-quality line or something designed for light home use. The latter may do you very well, but you want to know what you're getting when you begin to talk price.

Don't overlook accessories. The seller of used equipment is likely to have accumulated a good many of these at considerable cost. A used drill press offered at the original retail price may be a bargain if such items as a full set of drills and a mortising attachment are thrown in. An 8" dado head and some blades may cost as much as a medium-priced table saw.

Drill press: Watch for cracked castings and worn bearing housings

FIRST question is suitability. Is it rugged enough for the work you have in mind? Is it big enough—in distance from center of chuck to column? (This is how the size of a drill press is measured. A small, home model such as the 11¾" will drill a hole in the center of any circle up to 11¾" diameter.) Is the spindle travel long enough to suit your pur-

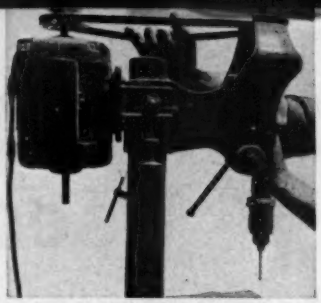




Major check points on a drill press are shown at left. If you could get inside the head casting, you'd see parts shown at right. Most wear occurs here, especially in the bearings.

Run quill down (left) and try to move it back and forth by hand. Watch out for too much lateral play at this point.

Test the chuck for wobble by putting a new drill in it and turning it by pulling on the belt (right).



poses? When you have answered these questions, you are ready to do some checking on the machine itself.

1. Is there lateral play between the quill and the headstock casting? Run the quill down and try to move it back and forth with your hand. If there is noticeable play, better just walk away with your wallet still in your pocket.

2. If the drill press has a tapered spindle, is the taper undamaged?

3. If there is a chuck, is it still accurate? Put a new drill into the chuck, and turn the spindle by hand. If the chuck is good, the drill won't wobble. If it does wobble, you may have to buy a new chuck. Typical price: $7.60.

4. Are the pulleys worn or cracked? If there are shiny spots on the bottom of the pulley Vs, add a couple of dollars for replacement to the price asked for the drill press.

5. Any cracked castings? These generally have to be replaced, and they are pretty expensive items.

6. How does it run? This, of course, is the crucial test, and if you have to buy without making it you are taking a big gamble. The best you can do in that case is to turn the spindle by hand. It should turn freely, without the gritty feeling or sound that indicates bad bearings.

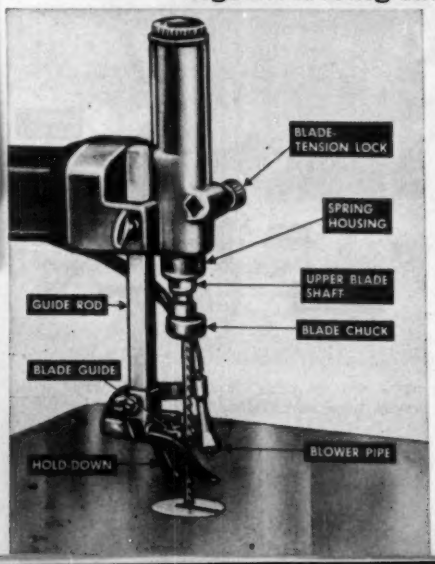
If the machine is set up to run, turn it on and listen. Excessive noise suggests that the bearing housings are worn, in which case the machine is of little value.

Put it through its paces as far as possible —drilling holes, of course, and using what accessories are at hand. In listening for noise, don't be perturbed by pulley whine at high speeds. That's normal. Rattles and roars, symptoms of worn or damaged parts, are what to listen for.

7. To check if table top is square with spindle, bend a piece of wire and put it in the chuck so that it almost touches the table several inches from the center. Rotate the spindle by hand to be sure that the wire will just graze the table at all points in the circle.

If the table proves out of square, there are two possibilities: it may have to be reground at considerable cost; or the surfaces at the table swivel may be out of line so little that it can be satisfactorily corrected by a little filing

Jigsaw: Is it big enough for your work?

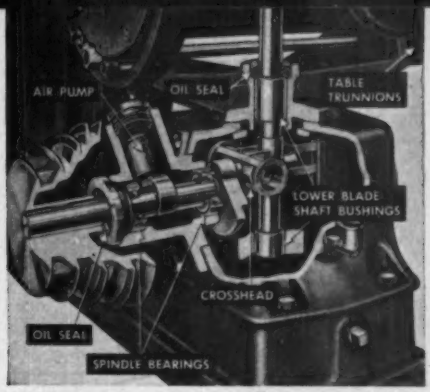


SUITABILITY here is a matter of size, quality, condition—and especially how you expect to use it. If you don't have a bandsaw and don't expect to get one, you may need a pretty heavy jigsaw, one that will do some work that properly calls for a bandsaw.

1. Try to move both upper and lower operating shafts from side to side. If there is play, try to find out whether the shafts travel in bushings or directly in castings. This is important because worn bushings are fairly easy to replace while worn castings are likely to cost you more than the machine is actually worth.

2. Check the driveshaft in the same way. Lateral play indicates worn bearings or castings.

Key test of a secondhand jigsaw: If you find lateral play when you try to wiggle the upper blade shaft, better add the price of new bushings or castings to the cost of the machine.



Hidden mechanism is equally important. Tests and checks explained in the text will help you determine the condition of rotating and reciprocating parts shown here.

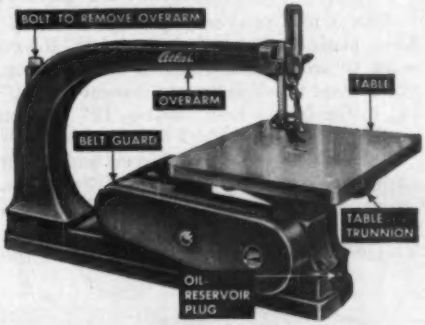
3. If you can, start the machine and listen. Noisy running indicates presence of worn parts.

4. Wear in the driving mechanism can be detected by holding the lower chuck with one hand and rocking the drive pulley with the other. Any wobble of the chuck shafts when extended indicates bearing wear.

5. Examine chucks to see if all parts are there and undamaged.

6. Inspect blade guides for wear. These can probably be replaced at moderate cost if the maker is still in business.

7. Check vertical alignment of the blade. Unless the overarm is adjustable, anything wrong here may indicate a damaged frame.



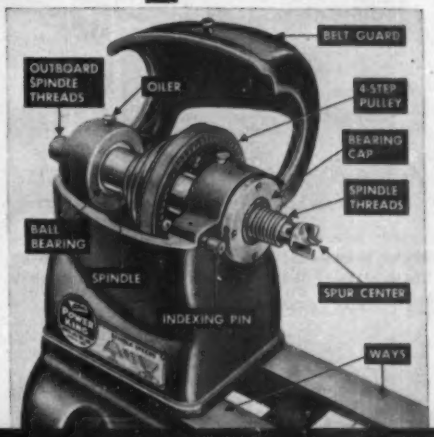
Principal parts of typical jigsaw are shown as you see them from outside. Check carefully.

Wood lathe: Are any accessories included?

Main lathe points are shown at right, but save closest inspection for inside headstock, shown in photo below. Check spindle for lateral play and make sure spindle threads are good.

BEGIN by asking yourself whether the lathe was built to do the kind of work you need it for. If it has an 8″ swing and you need a 12″, it is hardly a bargain for you at any price.

Same goes for distance between centers. The 24″ size may do nicely—but not if you want to turn table legs. And if you contemplate making some kinds of floor lamps, even 30″ between centers may not be enough. In that case, find out whether a bed extension can be bought. *(Continued on next page)*



1. Inspect the internal tapers in the headstock spindle and tailstock sleeve. If they are only slightly nicked they may be corrected; if they are badly banged up, they may call for $10 worth of replacement.

2. You can easily check the alignment of spindle and tailstock center by sliding up the tailstock until the centers almost touch. If they are out of line, see if adjustments will line them up. Also make sure that the sleeve in the tailstock can be clamped in this position firmly and without wobble.

3. Look closely at the threads on both ends of the spindle. If these are worn or damaged, add replacement cost to the asking price of the lathe. Current price for a new head spindle for a 12″ wood lathe is around $10.

4. Check the spindle for lateral play by trying to move it back and forth. If bearings or bearing housings are badly worn, you won't be able to do good work.

5. If you think you may want to use attachments for turning metals or plastics, make sure that the lathe bed hasn't been nicked or gouged.

6. Are any accessories included? Various chucks and arbors are worth having and may cost up to $10 or so. Wood-turning chisels usually cost close to $2 apiece, carbide-tipped ones run just about twice that much.

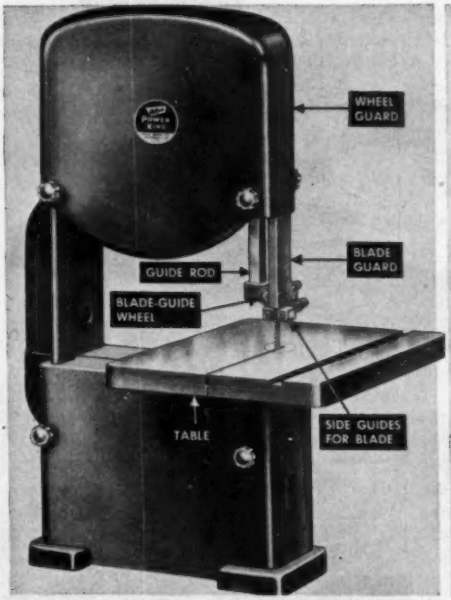
Bandsaw: Be sure it uses standard blades

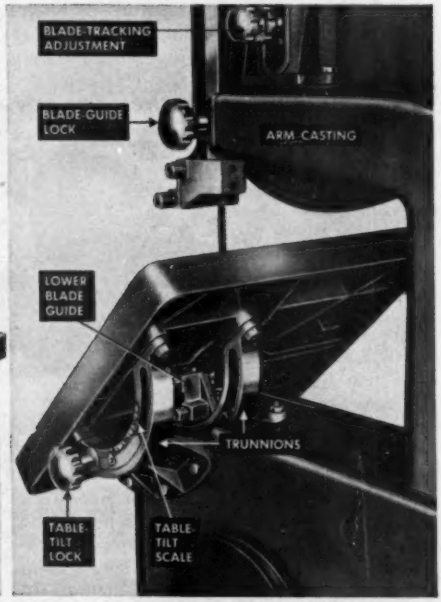
SIZE is measured in depth of throat, 12″ from blade to throat being typical. If you want to work thick stock or do resawing, you'll want to know the cut capacity—4″, 6″ or, on the bigger floor models, 12″ or even more.

1. Try to wiggle the upper and lower wheels. If you can do this, the bearings are worn and it may become impossible to keep the blade on.

2. For insight into the condition of the machine in general, by all means check the rubber tires on the wheels. Wear suggests that the saw has had extremely hard usage or that one wheel does not track with the other—indicating a defective or damaged frame. (Replacing worn tires doesn't amount to much in itself—they cost about 75 cents apiece.)

3. Blade guides are generally replaceable for a few dollars. But if block guides are badly worn or the ball-bearing guides won't





Make a general check of the parts shown at left above. Tilt the table and use a flashlight if necessary to inspect condition of table trunnions and lower blade guide, as shown at the right.

turn, be mighty sure that you'll be able to get replacements for them before you shell out.

4. There's another point where it is all too easy to get your fingers burned. Even if the machine is in fine condition and reasonably priced, it may not be an economical buy if it uses a non-standard blade. Having to have special blades made up all the time is inconvenient and adds substantially to operating cost.

5. Are the wheels in balance? To check this, take off the wheel guards and blade and spin each wheel several times. If the same part of the wheel ends up at the bottom on several spins, the wheel is probably out of balance. This may make the machine vibrate so much that it would spoil the accuracy of your work—to say nothing of taking most of the pleasure out of it.

6. If you can turn on the saw, let it run a bit, listening for uneven sounds. Watch to see if the blade can be adjusted to run near the center of both wheels, and that it doesn't hit the guards anywhere.

Open the bandsaw and take a look at the wheels and their tires. Try to wiggle the wheels. If you can do so, bearings are worn and it may be difficult to keep the blade on them.

Multiple tool: Is it easy to change from one tool to another?

If you are eagle-eyeing a secondhand Shopsmith, or one of the new flexible-use radial saws, or any other multi-purpose tool, you'll want to make many of the checks already mentioned, plus a few special ones.

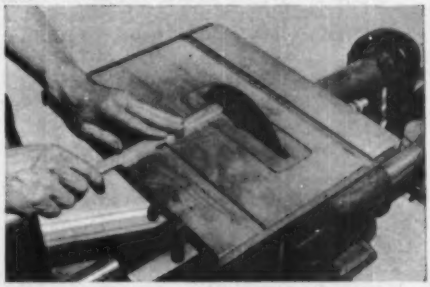
1. Even if it is not set up to run, you can put it through its changes to see how easily it converts from one tool to another. Watch for damage to bars or rods that might prevent an easy shift.

2. Look for external signs of neglect—cracks, mars and rust.

3. Most important is the condition of bearings and power-transmitting assemblies. About the only sure way to check these is to run the machine under power. Your ear will tell you more about the condition of the machine in 30 seconds than your eye could in an hour.

4. Put a saw blade or sanding disk on the spindle to find out if it runs true. You can check this by holding a piece of wood against the disk or blade as it revolves. If it does not maintain even contact, the blade or disk is out of alignment—or the spindle is. Switch to another blade or disk. If the misalignment still shows up, you can figure that the trouble is in the spindle—a fairly costly replacement on most tools, to be figured as part of the cost if you buy.

5. Check suitability of the combination tool much as you would with single-purpose tools. Is the depth of cut adequate for your sawing operations? As a drill press, is there enough distance from column to chuck? Is the spindle travel as long as you'll need for your purposes?



Heart of multiple tool like this Shopsmith is the spindle. Hold a stick against saw or sanding disk as it runs. Stick won't maintain contact all around if spindle doesn't run true.

Any power tool should be thought of as a long-time investment that will bring pleasure and often considerable profit to its owner. It will, that is, if it is a well made tool in good running order.

Hard-headed checking of your prospective purchase against these standards is one way to be pretty sure you are getting your money's worth. An inaccurate, balky or worn-out tool is no bargain, no matter what price you pay for it. END

Next month: How to judge a used circular saw, jointer, sander, shaper and electric motor.

Shutters Make the Difference

Painted a harmonizing color, they add that finished touch to any house. Here are four useful styles.

EVER notice how many new homes have a bare, unfinished look? Lots of them are that way because they lack one thing—shutters. Good blinds are easy to build with hand tools.

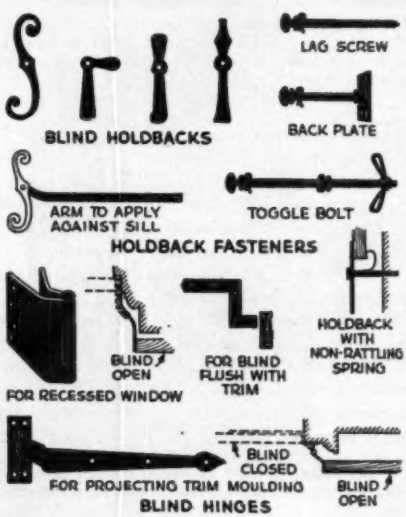
1. Shutter lines should follow the lines of the house. These blinds, of tongue-and-groove braced with one-by-twos, follow the horizontal lines of the house.

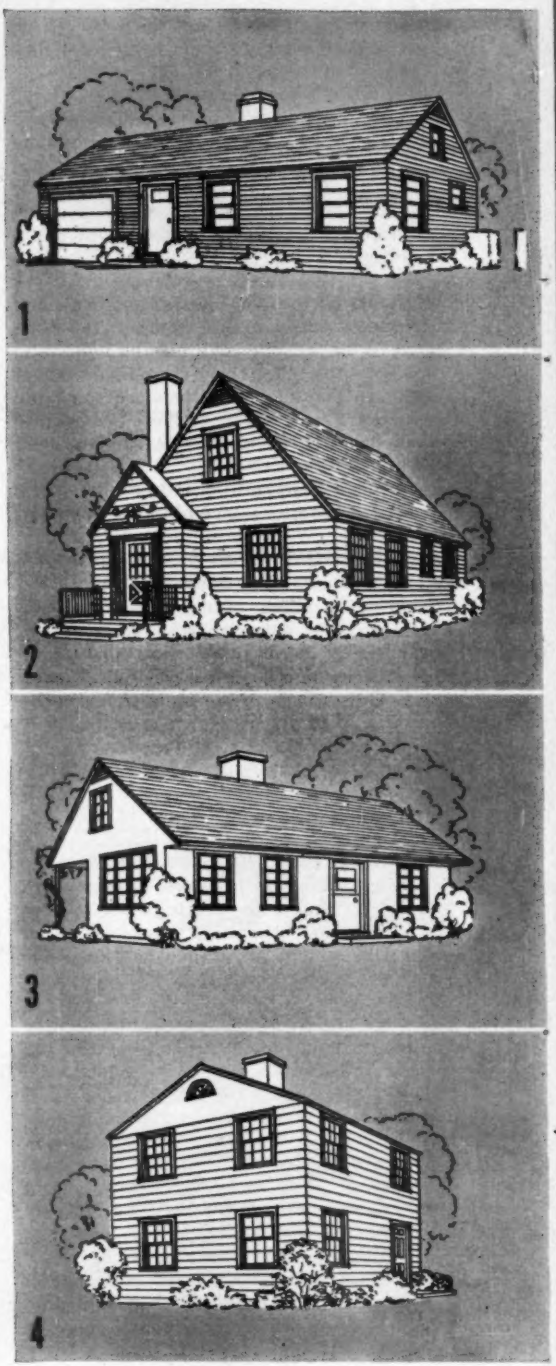
2. When there are no dominant lines, shutters made with angled boards look well. These are braced with 1″ strap iron.

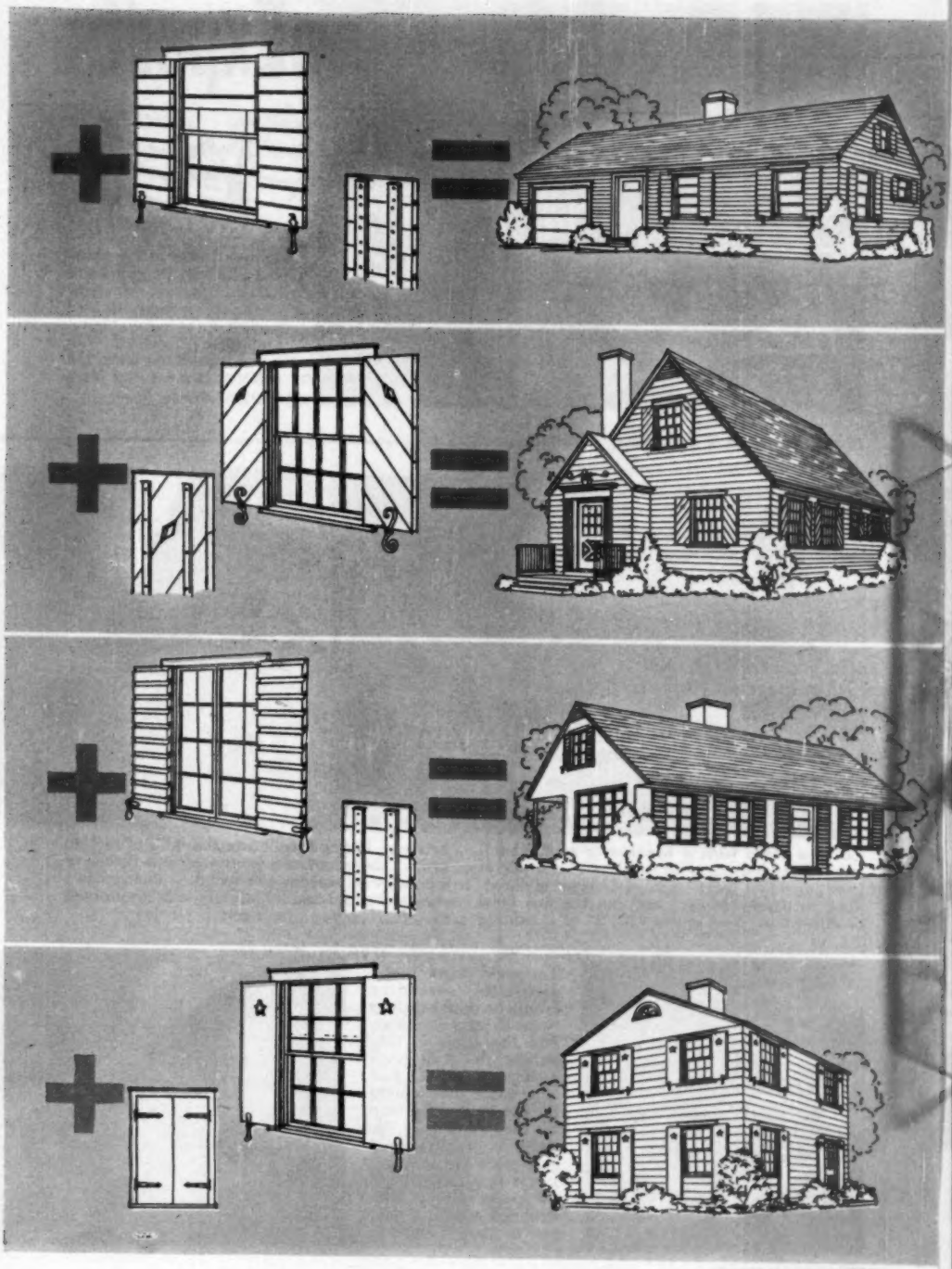
3. Shutters made of drop siding match the horizontal lines of the sash bars.

4. These are ¾″ exterior-grade plywood with ¼″-plywood stars as decorations.

Below are some types of shutter holdbacks and hinges that are available.—*Carl T. Sigman and William J. Ward, Jr.*



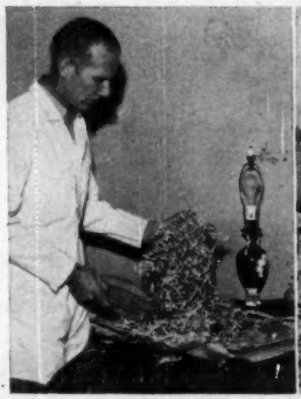




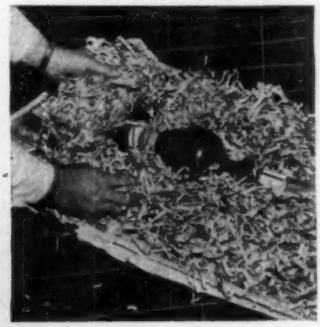
Experts

Three things good movers do on long-distance hauls. Glassware is individually wrapped and packed in a barrel (left). Lampshade, covered with tissue, goes into carton. Oil painting is measured for a shipping crate.

How to Pack Fragile Items



Cover a table with a blanket or quilt (left). Have shredded paper or excelsior and a pile of newspapers on hand. Spread 2" layer of shredding on paper (center) and put the first bowl or dish on it. Nest others with 2" of shredding between, letting it spill over the sides of each to protect the edges. Pack at most four bowls, or six plates or saucers, to a bundle. Pick up two sheets of paper and fold tightly, one corner over the other (right). No string is needed.



To pack china lamp, distribute shredding evenly on doubled sheet twice as long as object. Bed the lamp in this, pulling the stuff completely around it. Roll lengthwise into a tight bundle, tucking the ends of the sheet in. No string is needed. You can pack up to four lamps to a barrel. Fill the spaces between with wrapped cups and saucers to prevent shifting.

Show You How to Move

Here's how to handle everything from stemware to gas stoves without knocking yourself out. You can use these professional techniques even if you're just moving down the street, or switching furniture around.

WHEN it's your move, it's nice to call in some husky professionals with a van and go fishing until the chore is over.

But if your new home is just a few doors down the street, or you have some spare time and no grand pianos to worry about, you may be able to do your own moving. A station wagon or a rented truck, plus a day's work for you and a helper, should see the job done, with a saving in your pocket.

It'll take sweat, but you can save yourself blood and tears if you know how. This assumes, of course, that you're as husky as the average and in fair physical trim. Otherwise, you certainly shouldn't tackle it.

However, moving takes more than muscle. It calls for teamwork in handling two-man loads, know-how in packing fragile items and skill in loading the truck. Here's the low-down from 500 experts—the drivers and handlers of Bekins Van and Storage Co., an organization with 51 branches in 10 western states.

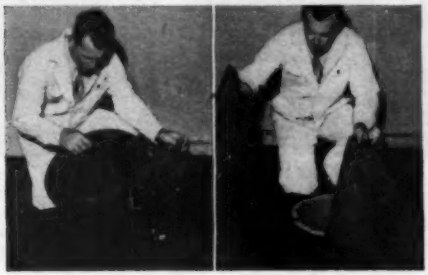
Skip the piano. Bekins men say you'll be smart to leave pianos to the professionals. Not even four husky amateurs can get a standard upright down a flight of stairs without risking broken limbs or worse. It takes a well trained team.

But the thousand and one lighter objects in a household really comprise most of the chore. If you don't mind hard work, you can move them.

What you'll need. Full-time movers

Pack barrel in layers, with 2" of shredding on the bottom and between layers. Put in heavy china first, then light pieces, with glassware near the top. Wrap each glass piece separately in shredding and newspaper. Always stand glassware on end. Pack excelsior or shredding between bundles. Wrap jars of preserves individually in paper, shredding, and again in paper. Pack upright in a barrel, but fill barrel only half with preserve jars. Pack the rest with light items.

Wrap small mirrors and pictures in pairs (below). Lay first one diagonally in center of pad or blanket, face up. Fold pad over and place second mirror over folded part, face down. Then fold the two side corners, tucking them under the top mirror. Fold fourth corner to complete the wrap. Load high in truck, flat if you have a smooth, firm support, or on edge.



When you move . . .

Pack plates and saucers on edge.
Pack stemware upside down.
Secure record-player arm.
Wrap sharp garden tools.
Bolt down refrigerator unit.
Drain garden hose.
Remove handles from bicycle, lawn mower.
Line boxes for books with paper.

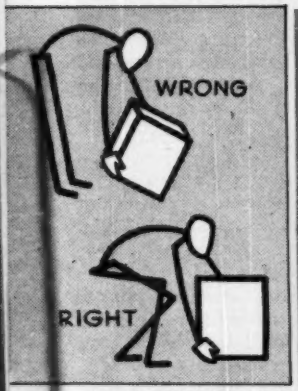
Never, never, never . . .

Fold innerspring mattresses.
Tip TV sets while loading or carrying.
Fold rugs; instead, roll them.
Pack more than six plates together.
Pack inflammable liquids or oil mops.
Slide packing boxes on the floor.
Stand on bare furniture when loading.
Load fragile items on the bottom.

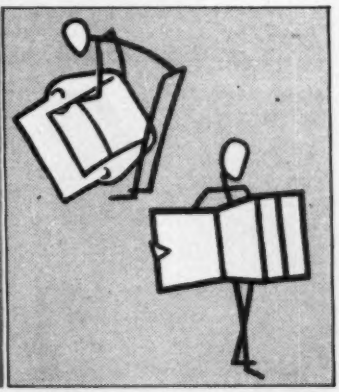
Wrap Light Furniture Before Loading

Fragile tables, light chairs and similar delicate pieces should be wrapped like this. Place the piece diagonally on a quilt. Fold nearest corner over the top, then the side corners, as at left. Wrap fourth corner over legs. Bundle is easy to carry (right). Remember to stow it high on load to avoid crushing.

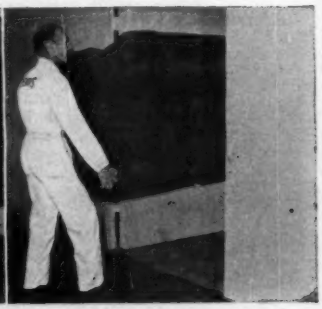
Here's the Way to Rassle the Big Stuff



Let big leg muscles, not back, do work of lifting heavy pieces. Bend knees, straighten up to lift load.



To carry overstuffed chair, stand on one side, place one hand against inside corner of far arm, and grasp outside of arm with other hand. Bend knees, pivot nearer arm against them, and swing chair onto your shoulders. To hook chair around narrow doorway, carry it as at right. Use two-man davenport carry for extra-big chairs.



Davenport is a two-man job. Each man grasps bottom near rear leg, and front of one arm. Piece is tipped forward first as at left, unless it has fragile legs. In this case it must be lifted and tipped simultaneously. Then it's held on the thighs (center photo) while rear hands are shifted down to what are now the bottom rear corners (actually front legs). You can get such a piece through a door 12" narrower than it is, by hooking it around the casing, one arm at a time, turning it as necessary to take advantage of the best angle.

like Bekins teams carry about $1,000 worth of equipment, such as tools, dollies, straps, and pads for a whole vanload at once.

Since you won't have all this equipment, you'll have to handle fewer pieces at a time. With a station wagon or pickup truck for hauling, you'll probably have to make your move in installments anyway. But there are some things you should have on hand.

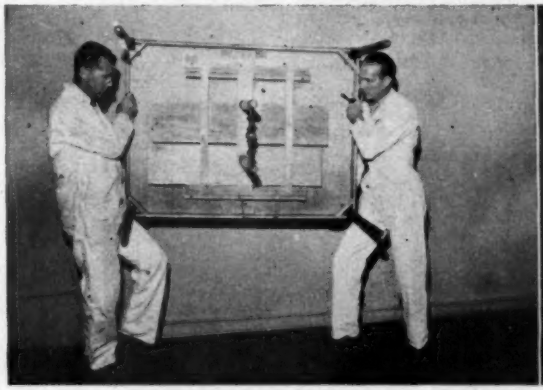
First among these is lots of excelsior or shredded newspaper, which you should be able to buy at a local warehouse. Don't skimp on this—it may save a treasure.

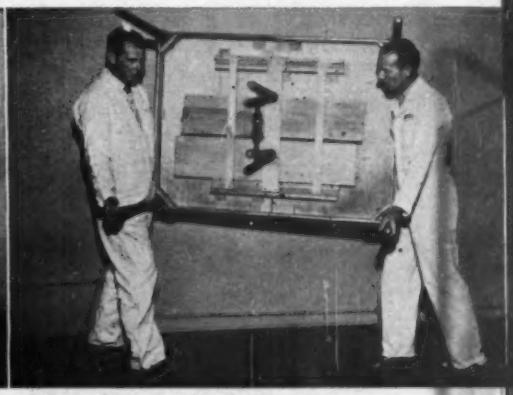
Collect all your blankets and quilts, and if possible borrow more. You may be able to rent some moving pads from a warehouse.

Two handy helps are "shoulder skins" and straps. The skin the experts use is a 7′ by 8′ piece of mattress ticking, folded diaper-fashion and placed around the shoulders. The ends are wrapped around the hands to protect them against sharp edges, while the center part enables you to get your shoulders under part of the load.

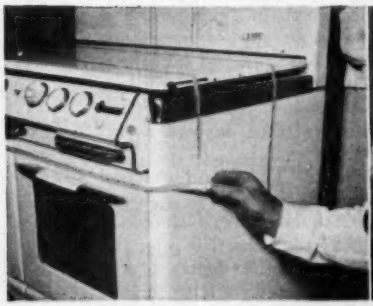
Straps may be lengths of belting or webbing 2″ wide. They are used much like shoulder skins, the ends being wrapped around the hands.

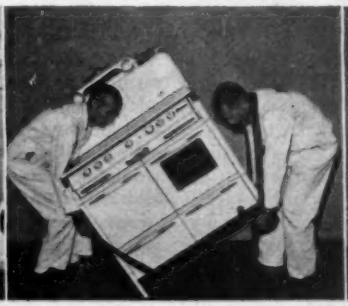
Save your back. Moving is hard work. Don't make it harder by starting with a

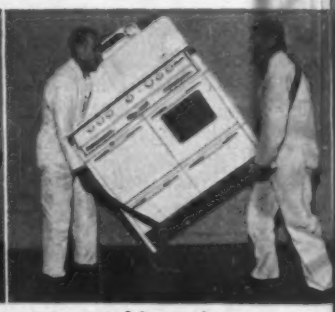




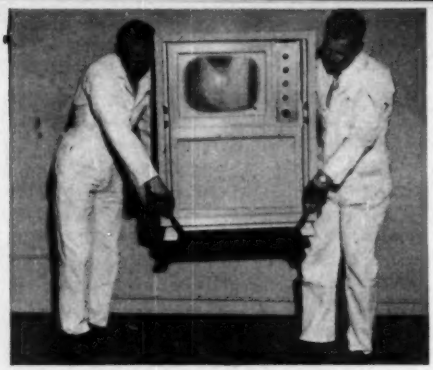
Turn tables on edge if they are to go through doors. With a helper, put one hand on the rear edge, the other under the adjacent edge nearest you. Lift and turn the table in one movement to position at left above. Rest it on the thighs while shifting the upper hands down to grasp lower legs near the ends. If doorways are a tight squeeze, drape a pad over the top to protect its finish. To negotiate awkward turns, better take off the legs.



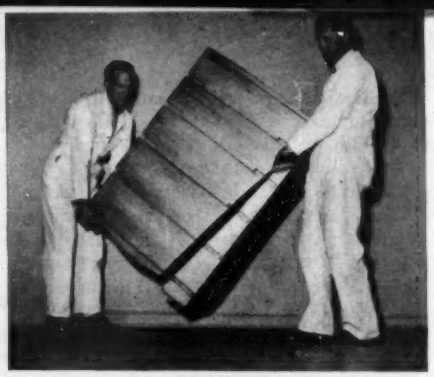




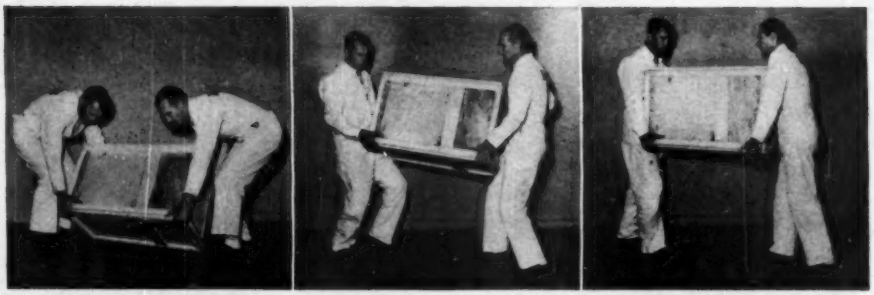
Ranges must be buttoned up with tape or string to hold doors and lids shut. Be sure the oven is empty, especially if the door is glass. Remove the grates and burners and carry them in a wooden box. Straps help shoulder the load, and protect hands. The man on the high end of the range puts the strap around his neck or on just one shoulder. Bend your legs as shown in the center photo; straighten them to lift. The man on left has part of the weight on the lower portion of his body. Refrigerators can be carried the same way as a range..



To tote TV sets, use a helper and a pair of straps. Carry set vertically at all times; otherwise you may knock tubes askew. Once on truck, wrap it and load so that screen isn't subject to pressure. The set can go under other things if the cabinet is strong.



Heavy chests, awkward to carry with hands alone, are no problem if one man uses strap. Lift chest tilted toward strap, as here, and also tilted back so that drawers won't open. For maneuvering around corners, it may be best to tie drawers shut. They are a good place for carrying draperies and curtains—rolled, not folded, to avoid creasing.



Two men can carry loaded boxes and trunks as heavy as 300 lb. like this. One hand on back edge tilts box back until second hand can grasp bottom front edge as at left. Men lift together, rest load on thighs (center photo) and shift rear hands down to bottom corners for the carry. On stairs, taller man should take lower end to keep load as level as possible. To set it down, one man shifts rear hand back to top, shifts other to let corner down to floor, and both men lower weight by bending legs. Never carry a heavy load behind you.

sprint. Be stingy with your energy, saving the old heave-ho for the times you really need it. Headwork can save you a lot of hard labor, even in the little jobs. For instance, don't punish yourself by wrapping small items on the floor, taking the stance of a bowknot to do it. Work on a table, and sit down to as much of the job as possible.

Things weigh less if the extras are detached. Legs usually come off tables if you unscrew one nut apiece. Gas grates and burners lift out of the range, and heavy chests don't have to be moved with the drawers filled.

If burners, refrigerator shelves, radiant-heater units and the like aren't removed from their housings, immobilize them with paper stuffing so that they won't be damaged or mar adjoining surfaces.

Stowing the load. You wouldn't put eggs under canned goods in a shopping bag, and the same principle applies in loading house furnishings. A fragile end table isn't worth much when it has traveled under a davenport or a steamer trunk. A good mover loads with his head as well as his arms.

Bekins drivers say: "The secret of good loading is planning. Think from the top down. What are the key pieces—the awkwardly shaped or fragile ones that offer the greatest problem? Pick other pieces of the right width, strength and height to form a base for these and protect them."

Remember that blankets or pads should be wrapped around vulnerable pieces to keep them from being jarred on the trip.

Good moving! END

DO IT THE EASY WAY

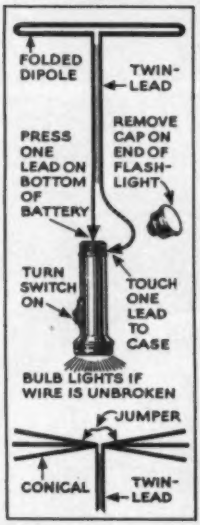
To stop blisters if your hands haven't toughened up, slip sponge-rubber powder puffs into the palms of work gloves. Anchor with adhesive tape.

To store a razor blade safely in a desk or cabinet drawer, clamp the cutting edge in a spring-type paper clip. Reverse the blade for cutting.

To strain paint, hold the cloth almost taut between embroidery hoops large enough to fit over the top of the can. Then the weight of the paint won't drag the cloth into the can.

To catch drips of oil that run down the spout and over the sides of an oil can, solder a washer to the spout. It will intercept drips, letting you wipe them away before they dirty the can.

Flashlight Tests TV Lead



THE twin-lead ribbon that connects your television antenna to the set takes a beating from the wind and rain. If you suspect a break in the down lead, disconnect both wires from the set and find out for sure with the simple flashlight test shown.

If you have a folded-dipole antenna, you can make the test without going out of the house. If not, connect a jumper across the arms to complete the circuit. — *Arthur Trauffer, McClelland, Iowa.*

Neg Envelope Softens Flash

TRANSPARENT photo-negative envelopes jammed over flashbulbs make excellent diffusers when you are shooting a close-up and want to soften the illumination.

Electrical Tape Fills Two Jobs

AN ELECTRICAL tape of glossy black plastic that sticks on contact eliminates the need for double-wrapping splices with rubber tape and ordinary friction tape. A rubber-like ability to stretch over twice its length makes it conform smoothly to odd shapes. Though unusually tough, it's only .007" thick and makes a neat wrapping in tight, small places. It's waterproof and unaffected by oils, acids, prolonged sunlight or intense cold. Marketed by the makers of Scotch tape, it has Underwriters Laboratory approval.

How to Photograph Your Boss

By Ralph Steiner

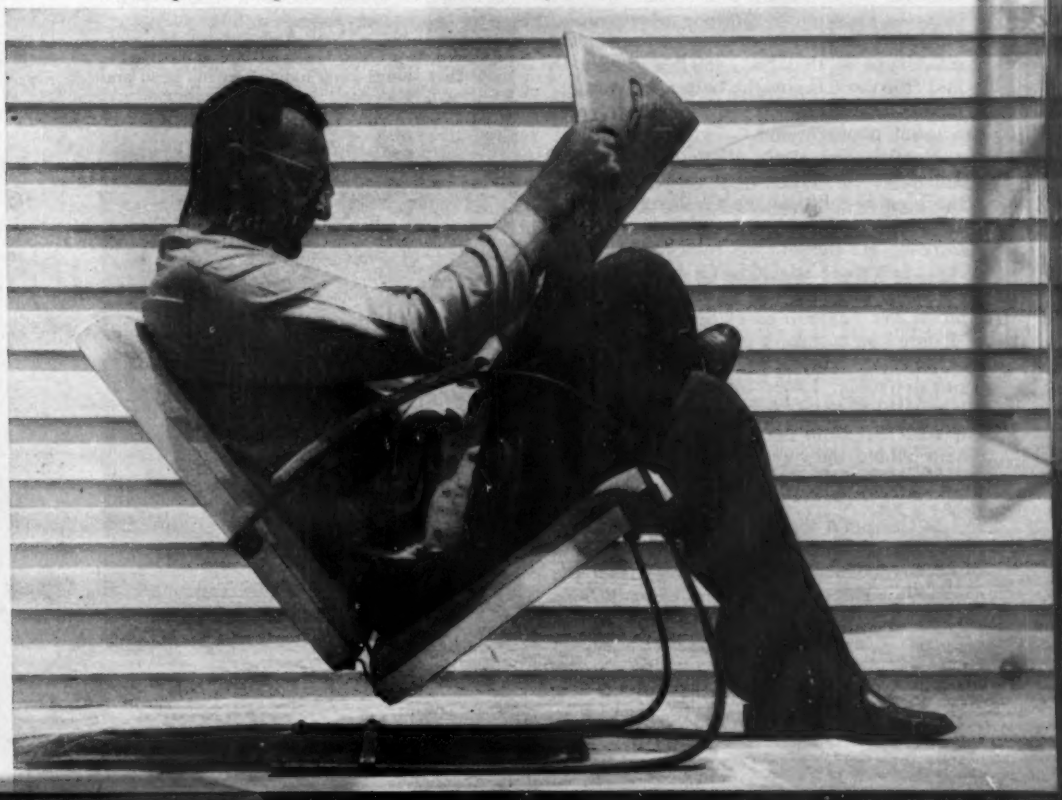
SOONER or later, every photographer who is worth his hypo is called on to photograph his boss. That's one of life's grim realities, so you'd better give it some thought right now and be prepared to do it well. Otherwise, that next raise in the paycheck may not come nearly so soon.

Successful men have to do a lot of posing for pictures, and successful men hardly ever feel comfortable when facing a lens. I know, because I've dealt with and photo-

Harold Renfield, liquor importer, freezes for lenses. After I'd made 54 shots, all unlike him, he suddenly unfroze, and the next six shots were easy, informal, happy likenesses.

Clarence Randall, boss of some 25,000 muscular workers at Chicago's Inland Steel, was no problem once I'd coaxed him out of his office into the plant. The photo was shot for *Fortune.*

Louis G. Cowan, radio and TV producer, relaxes way, way down. "Just keep on reading," I told him as he sat with the paper. "I'm doing you as Whistler's Mother." He did. And I did.



graphed a lot of them in my time: Wilson of AT&T, Wilson of General Motors, Greenewalt of du Pont, Folsom of RCA, and many others.

And I've made a lot of mistakes—so, at least, I can tell you what not to do when the day comes that you have to shoot (I mean, snap) the big boss.

Don't Shoot and Run

First, don't make the mistake the plant photographer is so often trapped into. Don't let the boss give you two minutes to shoot and run. The president of Procter & Gamble showed me some rather terrible shots of himself and wondered why they were so bad. I thought I knew. The blame, I told him, probably should rest squarely on his shoulders, not on the photographer's. "How so?" he asked. I closed my eyes and said: "I can see it all in my mind's eye—just how these pictures happened. You pulled your brass on the cameraman, told him to make it snappy. Several electric signs flashed on in the photographer's mind: 'TIME SPELLS TROUBLE,' 'FOCUS, THEN BANG THAT FLASHBULB,' 'GET OUT FAST.'" My guess turned out to be right.

Film, lens, shutter, flashbulbs operate mechanically, but there's a law that says that to make good photographs a photographer must use brains. And if you inspect the small type in that law, you'll undoubtedly find "the more brains the better the picture." Eastman Kodak up to now hasn't invented a robot photographer.

How do you apply photographic brains? You have to defeat what might be called the First Gambit, or the Challenge. I meet it whenever I enter a man's office with a camera. He tightens up, hunches his shoulders, gets more sticklike. Or he leans back, pokes his stomach out in my direction and molds his face into an expression that says: "I dare you to take a good portrait of me." In this state he's not fit for anyone's camera. But don't flee. I used to want to. Now I've learned that his rigor comes not from being bearish but from being scared of what the man behind the camera will do to him.

Decoy Diverts Subject's Attention

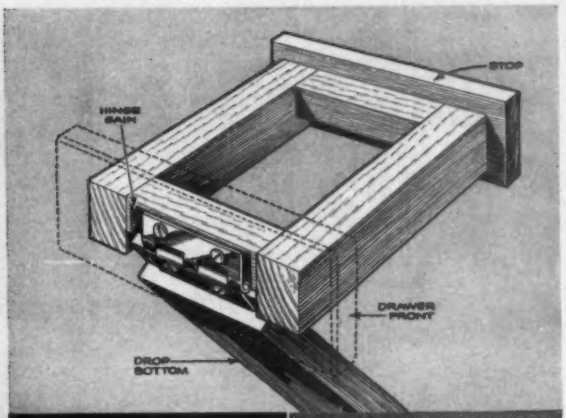
At this point the books on portraiture advise you to make your subject relax. Easier said than done. Unless you are a Durante or a Bob Hope and can fascinate the boss while making decisions about background,

[*Continued on page 262*]

William Lescaze, New York modern architect, is a natural. Accustomed to public speaking, he sits and looks happy for photographers. I took him with one flashbulb in an all-white room.

Paul Newman, a New York advertising vice-president, is a crack shot and hunter. I tried to show that things keep moving in his head and he always looks cool, starched, shoeshined.

The Case of the Vanishing Coin

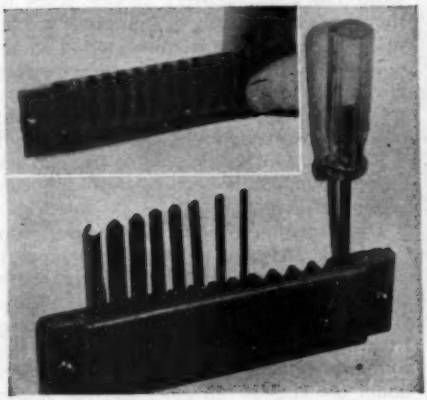


FOUR bits dropped into this novelty bank disappear faster than a buck at a supermarket, but you get more fun out of it because you've still got the dough.

Only the top drawer of this miniature chest slides in and out; the others are dummies. Pop a coin into the drawer, close it, and a hinged bottom lets the coin fall into the chest. Reopen the drawer, and the bottom snaps up into place again, leaving no clue to the coin's disappearance.

A trick drawer like this can be built into any sort of box or miniature furniture. The back stop, which keeps the drawer from being pulled out far enough to tip its gimmick, must be attached with the drawer in place. In the chest shown, this was done before the top was nailed on.

To withdraw your savings you could burn up the bank or use an axe, but it's better to have a trap door. Here, it's the bottom of the chest. The crosspiece of a cylinder lock straddles cleats inside to hold it in place.—*J. R. Schneider, Larchmont, N. Y.*



Harmonica Makes Drill Rack

THE cover of a 10-cent plastic harmonica will neatly rack up the drill bits and blades for an automatic screwdriver. Pry the toy apart carefully with a knife blade and mount the cover on the wall of your shop with wood screws.—*John J. Rea, Urbana, Ill.*

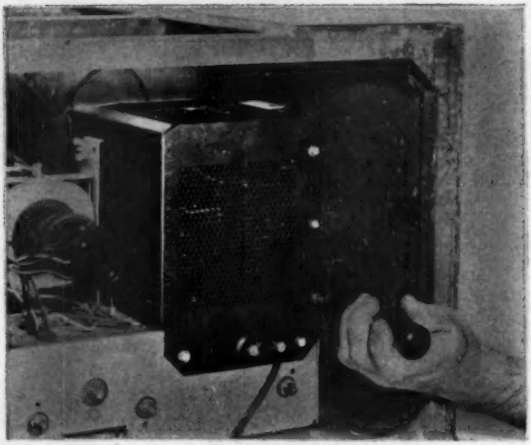
Work Gloves Always at Hand

I NEVER have to look for my work gloves any more. To keep them always with me when dressed for work, I sewed one clasp of a snap fastener to each glove and the opposite parts to my coveralls. When I take my gloves off, I just snap them to the coveralls. —*Charles O'Brien, Birmingham.*

What's Inside a TV Doghouse

Take a look and see. You won't get bitten if you know how—and it's where you're most likely to spot set trouble.

By Robert Hertzberg



To get inside doghouse on the common 630-type chassis, use a small socket wrench to remove screws in back. Line cord is disconnected.

ALREADY TV sets are sprouting their own folklore. One notion kicking around is that anyone who isn't an electronic expert should never go near the "doghouse"—that little steel box on the chassis where the high voltage lives.

Don't you believe it. The doghouse need not be dangerous. And the amateur repairman who avoids it may be missing a bet, because the tubes in it are among the most vulnerable in the entire receiver.

If the other tubes are working all right (see PS, April '51, p. 209), and if the sound is coming through, a dark picture tube can be traced directly to the doghouse in 99 cases out of 100. As a matter of fact, you *ought* to be familiar with the doghouse in your set. Otherwise, something like this may happen:

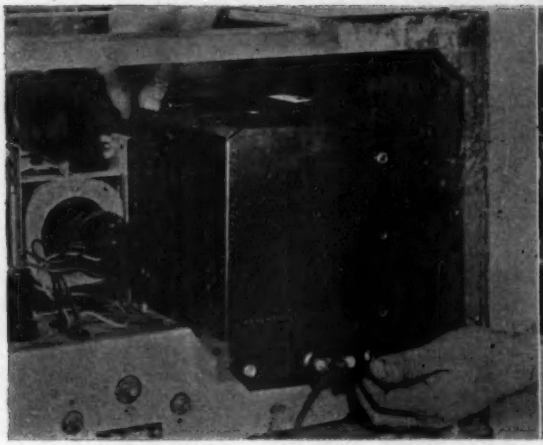
One day the picture tube goes blank. You check the line cord and antenna; all okay there. So you pull the chassis and check the tubes outside the doghouse; all okay there. "Oh-oh," you say, already feeling pain in the pocketbook, "the picture tube's blown." Then you call the serviceman. He replaces a bad tube in the doghouse and the set works fine. It leaves you with a why-didn't-I-do-that feeling.

Safety Rules. Nobody wants to scuffle with 15,000 volts. So make it a rule not to plug in the set with the doghouse open. There's one exception to this—when you want to see if the doghouse tube filaments light up—so be particularly careful to keep your hands out then.

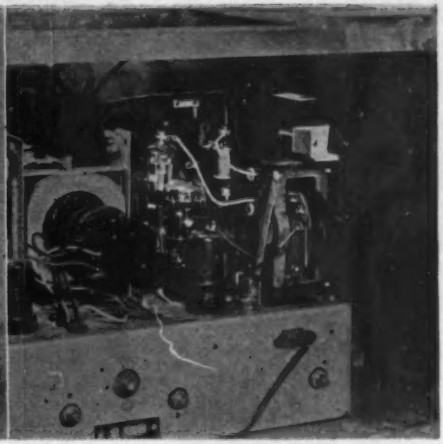
The second rule is to discharge the high-voltage condensers in the picture-tube circuit after you turn the receiver off. Locate the single well insulated wire from the doghouse to the side of the picture tube and pull it free where it joins the tube. Allow the fastener at the end to touch the chassis, thus discharging the high-voltage condensers. You may see small sparks jumping to the chassis. Be sure to put the cap back before you turn the set on.

What you need. A few common hand tools, the manufacturer's service notes for the set, and possibly a "cheater" are all that's necessary for troubleshooting in the doghouse. The service notes are important, as is a tube manual that lists the tube heater pins, allowing you to make a simple series check of the filaments. A cheater is a length of 115-volt wire with a plug on one end and fittings to match the set's power-supply connection at the other.

Doghouse construction varies considerably. In some receivers the compartment has a simple cover that yields readily to a screwdriver or pair of pliers. In others, you may have to remove eight or ten screws from the sides and edges. Some newer sets compartmentalize the doghouse in an area under the chassis. In most sets the power



Back and top now slide free. Line cord comes off, too. If you don't have "cheater," drill out rivets connecting plug to the cover.



Parts inside are now exposed. Freed plug now acts as "cheater." **Keep hands off with power on.** Replace rivets with screws on reassembly.

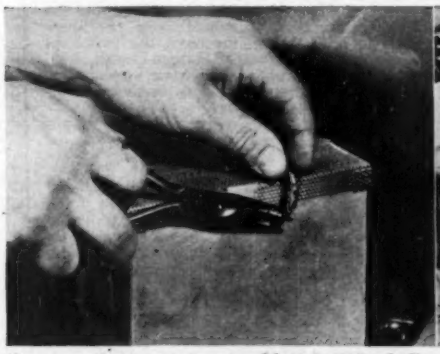
cord comes off with the rear chassis guard or the doghouse cover.

Dust it out. The first thing you'll notice is the thick coat of dust inside the doghouse, attracted by the heat and high voltage. Clean out the box with a soft paintbrush, but don't wield it too vigorously. Now plug in the set, turn it on, keep your hands well clear, and take a good look at the tubes.

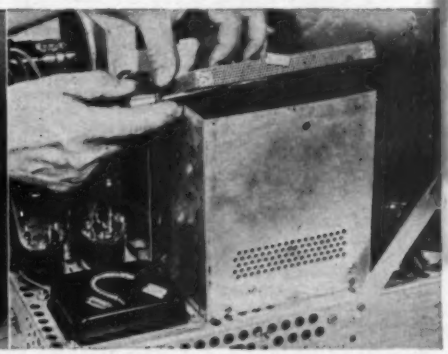
You can pretty well expect that the high-voltage rectifier, which you can identify from the service notes, will be dark. In many sets this is a 1B3GT. Remove it and make a continuity check of the filament (a series link-up of a single dry cell, a pair of earphones, and the filament pins is one easy way). If its filament tests "open," the tube is simply burned out and a new one is needed.

Circuit oddity. It is entirely possible, however, for the tube to be in good shape. Then a brand-new 1B3GT put in the same socket will likewise fail to light. This is due to an oddity of many TV circuits.

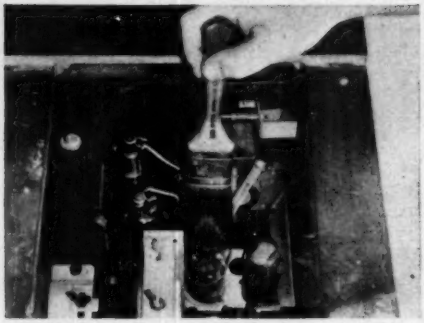
In most sets, all tubes except the high-voltage rectifier receive their filament current from the low-voltage windings on the regular power transformer. The rectifier gets its filament current from a special transformer associated with a tube marked



Can-type doghouse is opened by removing ball chain and gently prying off lid. Be sure juice



is off, condensers discharged. Take care not to bang lid or tools against picture tube.



Brush out dust with soft paintbrush, but don't injure fragile leads. Leave wires in same position you found them. If a tube has a spring socket, press collar on base to release it.

Slender plastic screwdriver is used to adjust width or linearity control in doghouse. This is done with doghouse reassembled and power on. **Never use a metal tool for this job.**

either "high-voltage oscillator" or "horizontal sweep output." If this tube goes bad, the rectifier gets no filament juice and fails to deliver high voltage to the picture tube.

Tube failure means more than just a burned-out filament or heater. It is common in TV servicing to encounter tubes that light normally and yet simply refuse to work in certain critical positions. Among these are the oscillator and horizontal output stages, the usual tenants of TV doghouses. It isn't uncommon to find an oscillator tube that decides to stop oscillating after a year or so, although it does fine if switched to the sound end of the receiver.

After replacing doghouse tubes, be sure you remember to replace the high-voltage lead to the picture tube that you pulled to ground the condensers.

In most TV sets, replacement of the doghouse tubes won't require readjustment of the various picture controls. At most, slight readjustment of the focus control may be needed. In some sets a control marked "linearity" or "width" is inside the doghouse, and is accessible through a small hole in the case. After you have the set buttoned up again, tune in a test pattern and, using an all-plastic screwdriver, carefully adjust this control. As with other picture controls, it's smart to mark the adjusting screw's original position before you change it. END

Got a sick car radio? See PS next month for simple ways you can cure it.

VACUUM CLEANER

If it will not pick up (upright type), the cleaner bag may be filled or badly clogged. The rotating brush may be worn or improperly adjusted so that it does not brush the surface being cleaned. The brush drive belt may be loose or broken. The nozzle may not be adjusted to suit the floor being cleaned. Adjustment is correct when a half dollar can be slipped under the nozzle edge between the nozzle and the rug. Low motor speed will reduce cleaning efficiency. If the motor runs slowly, it could be because of bad bearings, worn motor brushes or poor motor connections.

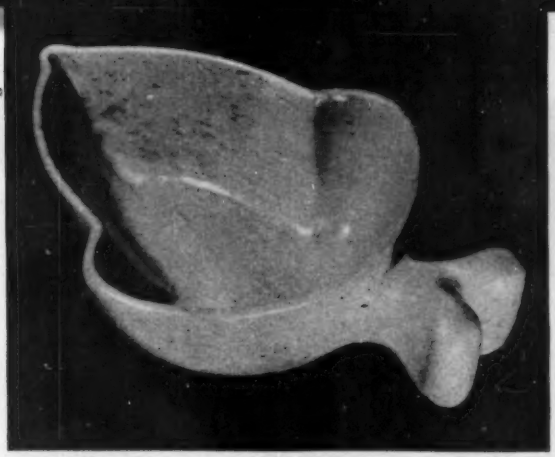
If it will not pick up (tank type), the cleaner bag or filter may be clogged. The wrong cleaning tool for the job may have been selected. The cleaning tool may be improperly used. Light pressure and slow, steady strokes do the job better than heavy pressure and rapid strokes. Low motor speed will reduce cleaning efficiency of this type too.

If it will not run, there may be an open circuit to the cleaner motor. First make sure the house circuit itself is not at fault. The break may be in the plug, the cord, the switch or the motor. In the motor, an open circuit could result from a broken wire, loose connections, worn brushes, worn or dirty commutator or open field.

If it is noisy, the bearings may be dry, tight or worn. The motor armature shaft may be bent so that the armature is rubbing on the pole shoes. A loose, bent or broken fan will cause excessive noise. On the tank type of cleaner with two fans, noise may result if the fans are out of balance. They can be balanced by loosening the fan nut and turning the outside fan one-eighth turn, then tightening the nut again. Repeat until the cleaner runs quietly.

(From *Electrical Appliance Servicing*, by William H. Crouse.)

FOR YOUR POPULAR SCIENCE INFORMATION FILE

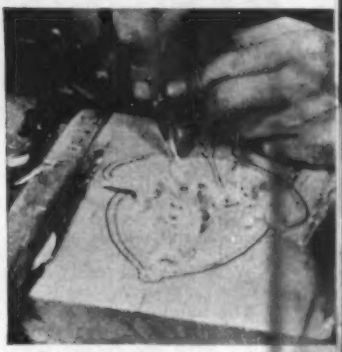


1 Mason first draws the outline of the bowl, using separate templates to mark the inner and outer edges. He uses a third template on the underside to outline the bowl bottom.

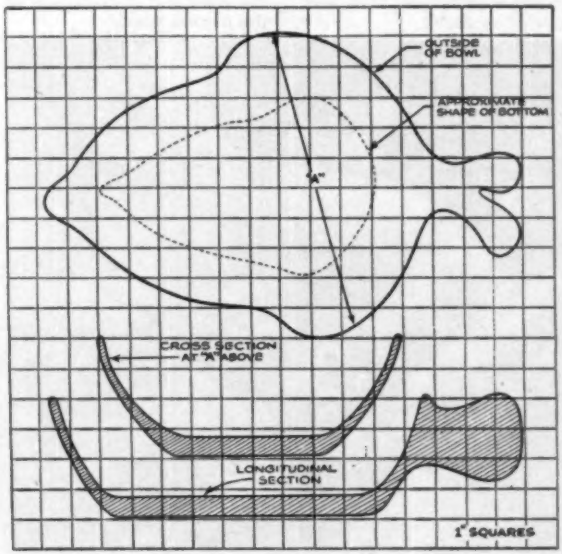
How a Craftsman Carves a Bowl

It takes effort, but the handsome results are worth it.

SHAPING bowls from many varieties of wood has been a long-time hobby of Edward H. Mason, supervisor of the Roosevelt National Forest. He admires the rich grain and color of fine wood and enjoys ferreting delicate shapes from twisted branches and knotty pieces. He does all his carving by hand. The photos here and on the next page show the steps by which he turns a slab of hardwood 2" thick into the handsome acorn bowl above.—*David F. Costello, Ft. Collins, Colo.*



2 Carving can start anywhere along inner line. Mason first makes shallow cuts, then works down steep-sloped sides. As he nears the bottom he checks the depth with calipers.



3 An electric hand grinder quickly smooths the gouged-out sides and bottom and shapes a lip at the tip of the bowl so that it may be used for pouring.

[*Please turn the page.*]

4 Inside of bowl is sanded smooth and a coat of lacquer filler is rubbed in. Mason finds it more convenient to finish the inside before starting to shape the outside of the bowl.

5 Roughing the outside. Mason uses a handsaw, then a coping saw to hew off surplus wood until a crude outline of the finished bowl begins to appear. Gouges help on some curves.

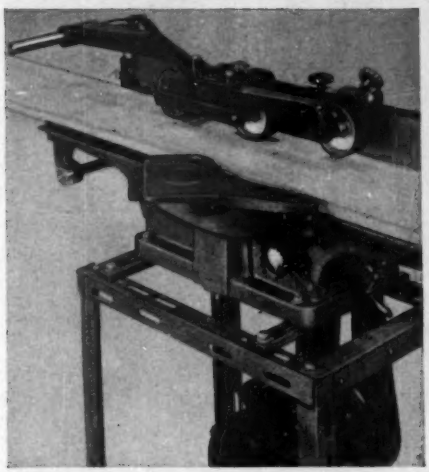
6 The outside is shaped with rasps until the edge is ⅛" thick and the bottom ¼". He's careful to caliper the work frequently, especially toward the end. Sandpaper smoothes the rough rasp bites.

7 The handle is left to last and it, too, is shaped in stages. First, the coping saw follows the outer curving lines, then small rasps cut in details and round off the outer surfaces.

8 The electric grinder completes the shaping and evens off all rough spots. The handle and outside of the bowl are then ready to be sanded, coated with lacquer filler, and sanded again.

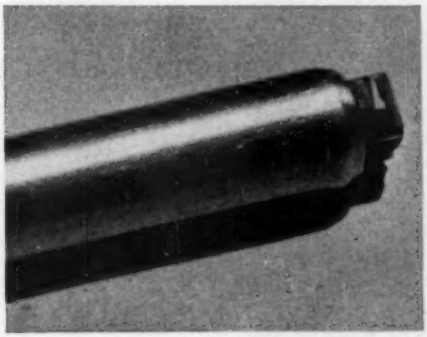
9 The finish coat. Mason sometimes brushes on white shellac, sometimes rubs in powdered pumice and castor oil. Both finishes emphasize the color and grain texture of the natural wood.

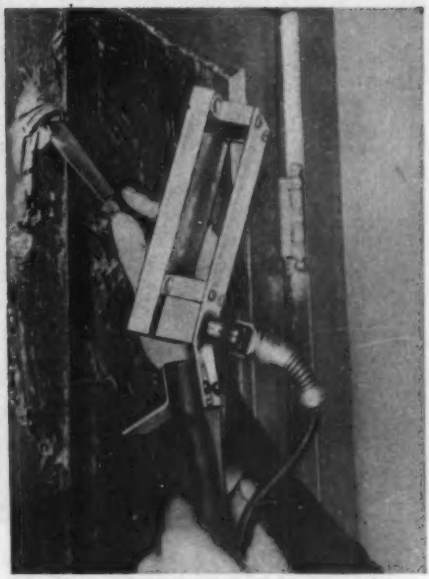
New Tools



Hold-Down for Jointers. The roller system of this attachment holds stock against the jointer fence and table without effort by the tool operator. After the work is started under the first roller, a push stick is used to feed the work. The rollers, slightly toed in, track the stock snugly against the fence and also keep it planing flat and accurately. *Duro Metal Products Co., Chicago.*

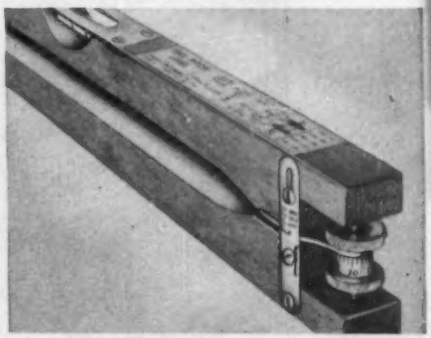
Dresser for Grinding Wheels. Boron carbide—the hardest substance known, except for the diamond—is used as the point of this tool. The boron carbide insert is held in a 5″ aluminum handle. The tool can dress medium-hardness grinding wheels that are 10″ or less in diameter. *Robert Marks Co., Providence, R. I.*



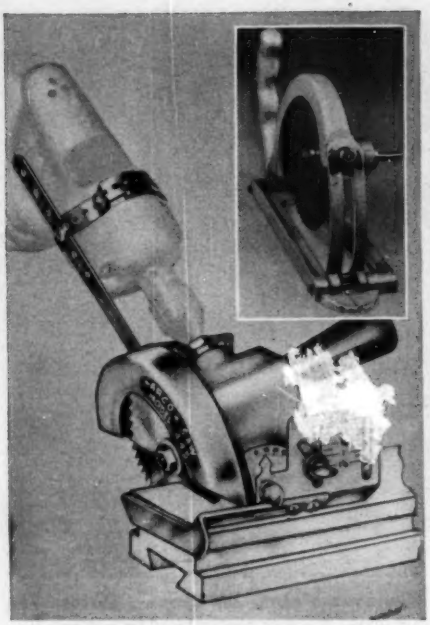


Removes Paint, Wallpaper, Putty. You also can use this tool in laying asphalt tile. It heats to its operating temperature, near 1,000° F., in about three minutes on AC or DC. *B & L Tool and Machine Co., Plainville, Conn.*

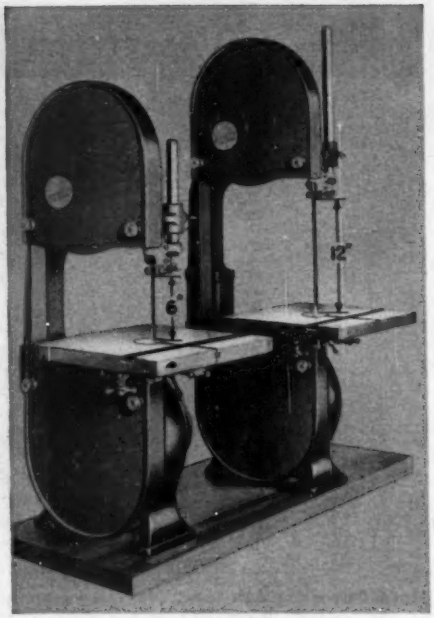
Level Sets Pipe Pitch. The angular adjustment on this 20½″ level helps you set pipes and drains to the pitch you want. In use, the gauge is turned to the desired pitch and the level is placed on the pipe. When the pipe has that pitch, the bubble will center. To get the pitch, divide the total fall by the length of the run. That figure is set on the adjustment at one end of the level. The other end is hinged. Set to zero, tool is an ordinary level. *Dreier Bros., Chicago.*



Please turn the page for more new tools.



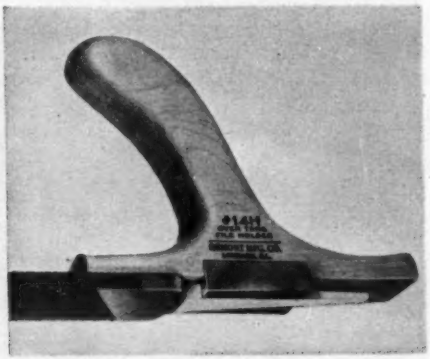
Saw Attachments Cut Miters. Both of these attachments for electric drills can be set to saw bevels up to 45°. Besides the bevel gauge, the one in the larger photo above—made by Arrow Metal Products Co., New York City—has rip and depth gauges. The other (insert) is marketed by Cardinal Creations Corp., Long Island City, N. Y.



Attachment Enlarges Bandsaw. Delta bandsaws with a 6" capacity can be stepped up to 12" by use of that company's height attachment (right above). It consists of a cast-iron raising block and the necessary fittings. A longer hexagonal guide post is included. *Delta Power Tool Division, Rockwell Manufacturing Co., Milwaukee.*

Power-Tool Kit for Home Use. Included are a 6" sander-polisher that can be used as a ¼" electric drill, seven twist drills, a 3" grinding wheel, bench stand, hex key, chuck, sanding disks, lamb's-wool bonnet and a steel carrying case. *Skilsaw, Inc., Chicago.*

Handle for Files. This handle provides a comfortable grip above a file, leaving the entire cutting surface of the file unobstructed. The file is mounted by driving the tang in the steel V block under the wooden handle. *Remont Manufacturing Co., Lombard, Ill.*



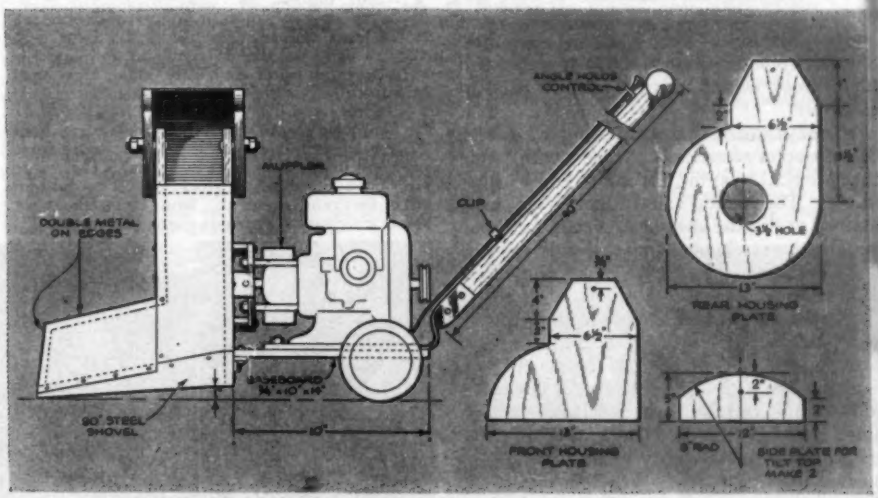
I Shovel Snow with a Lawn-Mower Engine

Blizzards needn't mean backaches if you hitch gasoline, instead of your sacroiliac, to the snow shovel.

By Howard G. McEntee

THOSE big rotary plows clear snow from the highways with impressive ease. My midget works on the same principle. It's not meant for Minnesota drifts, but it can handle snowfalls under 6″ deep and will even take care of heavier storms if you don't mind running it back and forth during the storm.

Building the plow gave me a chance to use a lawn-mower engine that would otherwise be standing idle. Now, before cold weather arrives, I simply transfer the engine



—a 1.2-hp., two-cycle job—from mower to plow.

When a storm comes, I roll the plow along my walk and driveway, scooping up the snow while the engine drives a whirling rotor, throwing the snow up and to one side by centrifugal action.

Materials used. Wood parts were all cut from ½" exterior (weatherproof) plywood except the baseboard. Here, I used the ¾" size for additional strength. The rest of the housing is sheet metal, with some angle iron to join or reinforce various parts.

For the scoop that is pushed into the snow, I chose a heavy old steel snow shovel. This is better than an aluminum one, since the steel is stronger.

Making the scoop. I kept the steel edging and underneath braces of the shovel to maintain stiffness. The back edge was cut and bent to fit around the wood housing plate. The shovel should be nearly level, just enough incline so it clears the sidewalk at the rear when the wheels are in place. Two wings or cheek pieces join the scoop and housing rim.

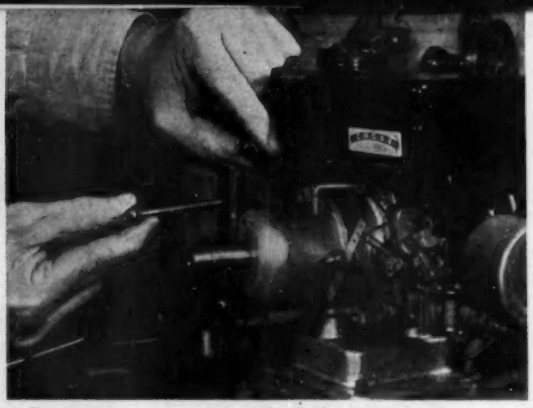
Roundhead wood screws hold the metal to the plywood plates. I made the many sheet-metal holes required with a hand punch, which is much faster than drilling. I used washers wherever nuts or bolts bear against the wood.

The rotor. Mounted on the motor shaft, the rotor required careful construction and exact balancing. An unbalanced rotor could shake the plow to pieces.

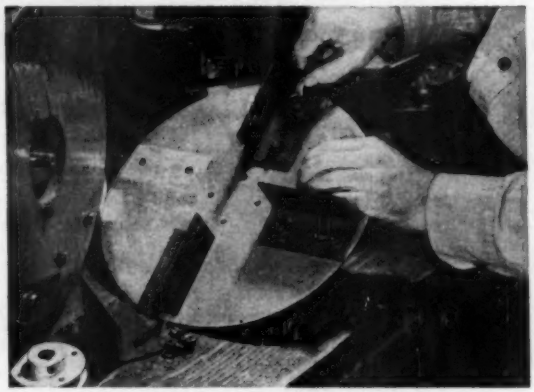
But balancing isn't difficult. During the course of building and changing designs, I had to rebalance the rotor several times. Smooth running showed I hit it well each time. Lock washers secure all nuts used in assembly.

Final details. Express-wagon wheels of 6½" diameter were used. Wheels with fatter tires would be better, for mine tend to stick in ruts. The handle came from an old lawn mower, as did the strap-iron pieces that hold it. These were heated dull red with a gasoline blowtorch, then twisted and hammered to the desired shape.

An auto choke wire, linked to the pivoted arm, controls the throttle. Radio spaghetti was slipped over the wire to protect it from moisture. Actually, the centrifugal governor controls the throttle, and the hand control limits governor action. The governor helps keep engine speed steady when the plow is pushed through snow.

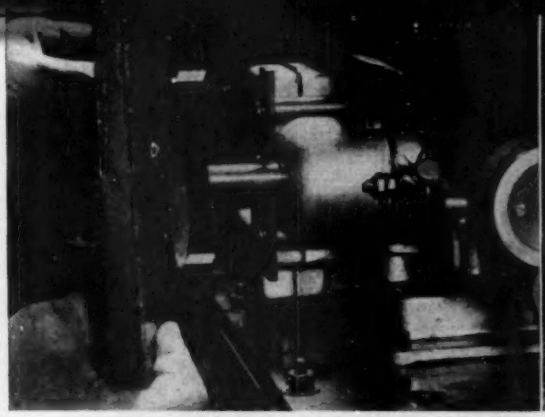


1 Engine was mounted with shaft projecting beyond one side of ¾" by 10" by 14" baseboard, bolts holding it in place. To support rotor housing, a piece of strap iron was attached to governor-shell boltholes. Two long screws and pipe spacers hold it alongside shaft.



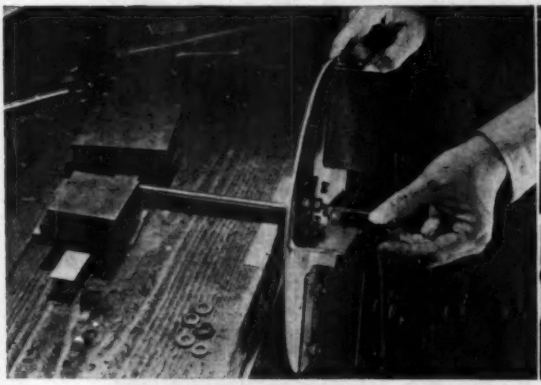
4 Rotor blades, 3½" matched lengths of ¾" by 1½" by 1½" angle iron, are mounted with ¼"-20 bolts. Blades are spaced 90° apart with vertical flanges radial to center of disk and the ends all equidistant from disk edge. Hub must be carefully centered for good balance.

7 Front edges of housing sides were bent over and punched for bolts that secure front plywood plate (here held in hands). This piece has a length of angle stock bolted to bottom edge for reinforcement. Iron takes shock of small ice chunks, prevents damage to wood.

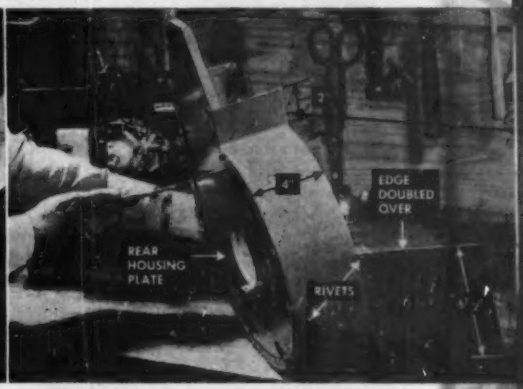


2 Back plate of rotor housing, cut to shape shown in drawing, was then fastened to strap iron. Two ¼"-20 screws, run through plate and wood spacing blocks, were turned into holes tapped in strap ends. Plate was also bolted to angle iron bolted under base.

3 Rotor consists of 12¼" disk cut from ¼" aluminum, a 3" cast-iron V pulley (used as a hub) and four heavy angle-iron blades. Here, disk center is being found with combination square. I avoided a die-cast pulley for hub; it might fly apart under centrifugal force.



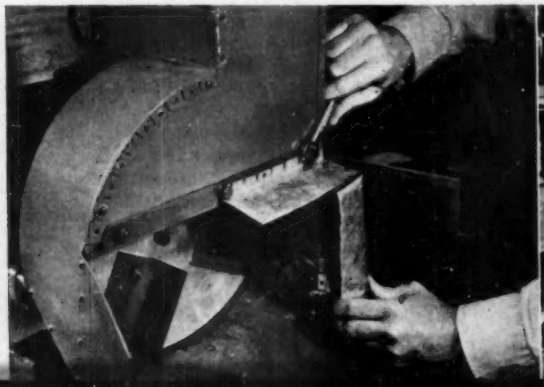
5 Balancing the rotor. Rest a ⅜" shaft on steel rule at edge of bench; weight down second rule over end of shaft. Slip washers on bolts until rotor stops at different place every time you spin it. Then take off nuts and clamp washers on.

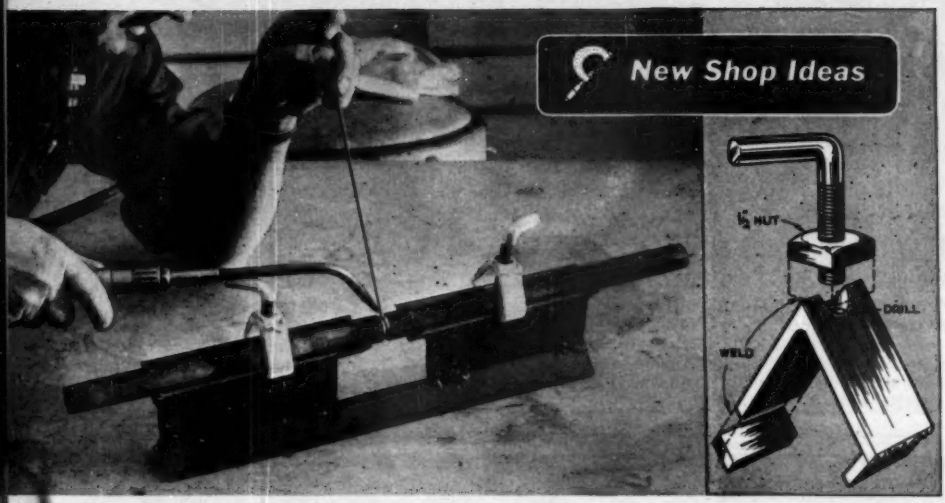


6 Making the scoop. Rear housing plate was removed to attach scoop and housing sides. Steel snow shovel was bent at rear to conform to housing curve. Tabs cut in edge were bent over and fastened to plate with wood screws. Wings were riveted to scoop sides, housing rim.

8 Sheet-metal shield mounted like this was my solution when counterclockwise rotation of blades threw some snow out of scoop instead of up stack. Later experience has shown it may be best to omit front vertical flange of shield. Shield is bent from single metal strip.

9 Tilting top, made of two pieces of plywood with curved sheet-metal hood joining them, pivots on two bolts set into stack. Bolts are drawn up just tight enough to hold, so I can swing the top and direct stream of snow to whichever side happens to be best. END



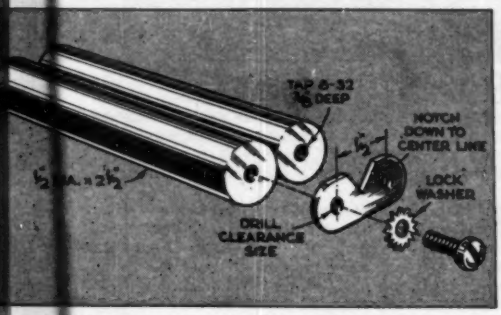


Welding Butted Ends. A jig for welding rods, pipe, and bar or angle stock end to end is itself a simple welding job. It holds two pieces of the same size in perfect alignment and permits welding entirely around them.

Weld two pieces of 2"-wide flat stock on top of a length of angle iron, leaving 4" between them. Make two clamps by welding nuts to short sections of large angle and adding small pieces to the ends as in the drawing. Cut the heads off two bolts and bend the shanks into handles.

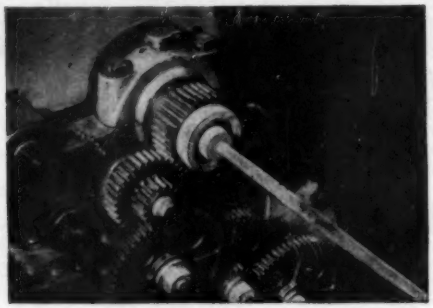
With the clamps, secure two lengths of angle iron to a piece of shafting or pipe to align them, leaving a gap of 2" between the ends. Then weld the clamped angles to the top edges of the flat pieces.

To hold two rounds of unequal diameter concentric, bush or shim up the smaller one. *—Herman Adolf, Richmond, Calif.*



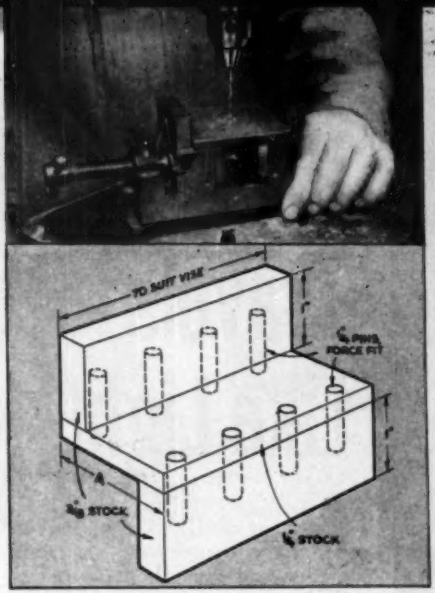
V Block Is Renewable. Costing little to make, this V block can be renewed as it wears simply by turning the round bars to expose new working surfaces.

Face the ends of two pieces of bar stock to equal length, centerdrill, and tap 8-32 to ⅜" depth. Cut two end links from 1/16" or ⅛" flat stock. Clamp them together and drill through both at once, spacing the holes just the diameter of the bars apart. Assemble with the bars held down on a flat, true surface.*—Harry D. Cousins, Chicago.*



Bushing Stops Whip. It's risky to let a rod extending through the lathe spindle whip around. Besides putting a heavy load on the chuck, it may bend and flail about dangerously.

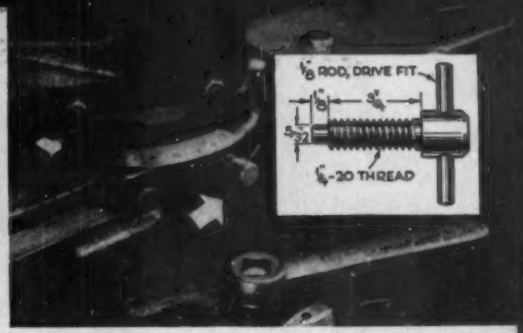
To play safe, find a bit of dowel or a wooden plug that's a light drive fit in the end of the spindle. Chuck it and drill through a close fit for the rod to be turned. Tap the resulting bushing into the spindle. If it's a trifle loose, wrap it with paper first.*—Will Thomas, Buffalo.*



Enlarging Machine Vise. Sometimes you bite off more of a job than your drill-press or milling-machine vise will chew. Instead of fussing with blocks and hold-downs, make these extension jaws to take over where normal vise capacity leaves off.

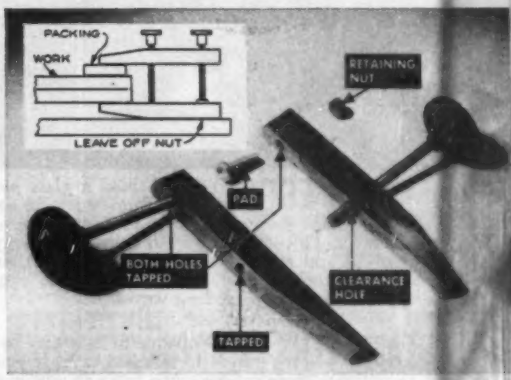
Cut six pieces as long as the vise is wide, but make the width *A* in the drawing such that, when the vise is closed, the extension jaws will have the same capacity as the vise alone has wide open. This gives you an uninterrupted size range. Drill the pin holes for a solid force fit.

Such jaws will hold flat or square pieces for normal machining, but aren't recommended for heavy milling or shaping, or for odd-shaped work.



Quick Gib Adjustment. After adjusting the lathe cross slide to move without play, you may have to lock up the gibs for milling or some other job requiring a rigid setup. To avoid such frequent readjustment, replace one setscrew with a T bolt.

You can turn and thread one from stock, or shoulder down a cap screw. Drive in a bit of rod as a handle. Set the other screws for cross-slide travel, making any tighter adjustment with the T bolt alone.—*Harry L. Truchelut, Atlanta.*

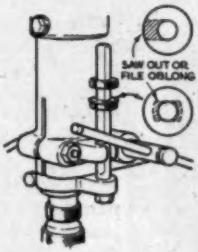


Clamp Works Two Ways. By tapping through where the outer screw of a parallel clamp bears, you can use both screws in one jaw. Clamped work can then be held on a machine table without the screw getting in the way. If the through screw protrudes, substitute a shorter one or insert packing.

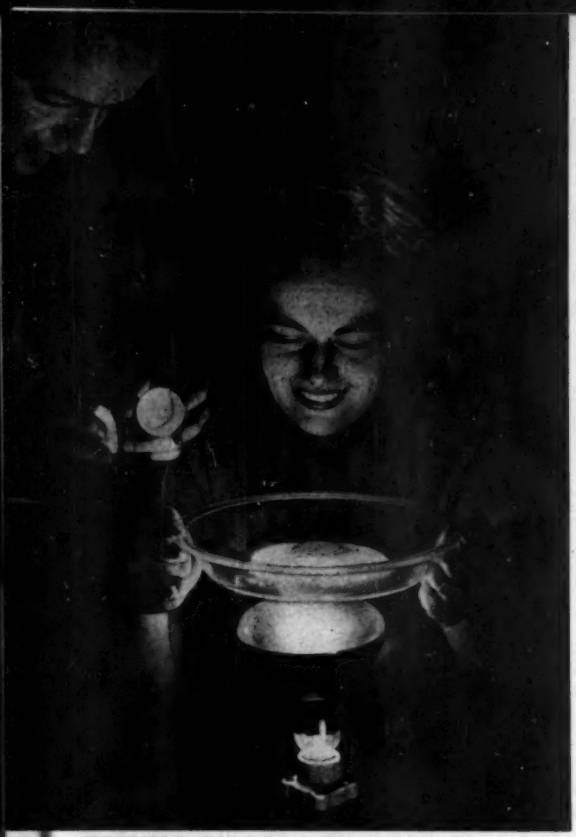
For maximum convenience, alter at least two clamps. Drill through and tap the hole. Make a pad, from a bolt small enough to slip into the hole, for the screw to bear against. Retain it with a nut.

The clamp shown is fitted with 1¼" knurled knobs that will hold most jobs when turned finger tight, eliminating the need for a rod. Turn knobs from bar stock, tap, thread them on, and pin.—*Floyd McGuckin, Ridgewood, N. J.*

One-Hand Depth Setting. A keyed washer between the stop nuts on a drill-press depth gauge saves time in making frequent depth adjustments. With such a washer, the lower nut will stay put and not turn while the lock nut is tightened on it. The adjustment can therefore be made with one hand while the other is occupied.

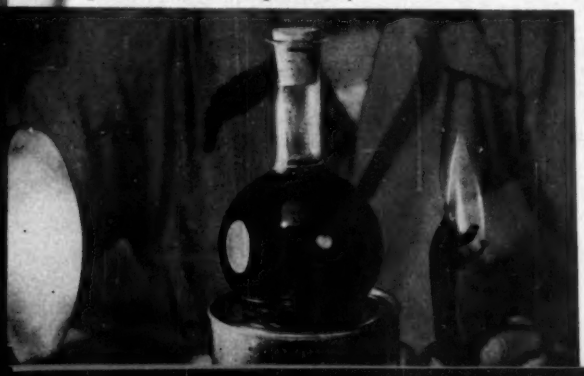


Simply alter an ordinary washer as shown in the drawing. File the opening to a slip fit over the flats on the threaded rod.—*Fred Lettino, Astoria, N. Y.*



FRYING EGGS You can hold a glass pie plate in your hands while an egg fries in it. Radiant heat goes through the glass, scarcely warming it. The egg, more opaque to infrared rays, absorbs heat and is cooked. Radiant heat dries thin paint films from the inside out because, like the egg, they are semi-opaque to these heat waves.

BLACK LENS What's opaque to light may be transparent to infrared rays. If you fill a 300-milliliter chemical flask like this one with water, it will focus the beam of a heat lamp into a bright spot, but the spot will be hardly warm. The water passes light, but in this thickness absorbs most of the infrared wave lengths. Fill the flask instead with carbon tetrachloride, adding 3 grams (1/10 oz.) of iodine to turn it dark. Now you'll quickly snatch your hand out of a fiery focus you can't see. Black paper held there bursts into flame. The dark carbon tet blocks visible light, but passes radiant heat quite freely.



How You Can Use

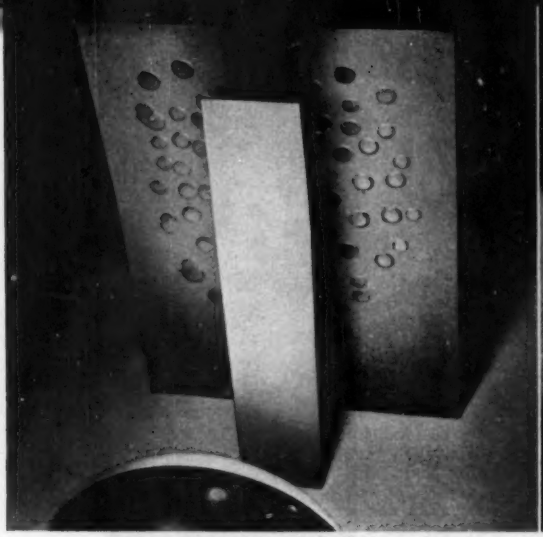
Heat That Travels Like Light

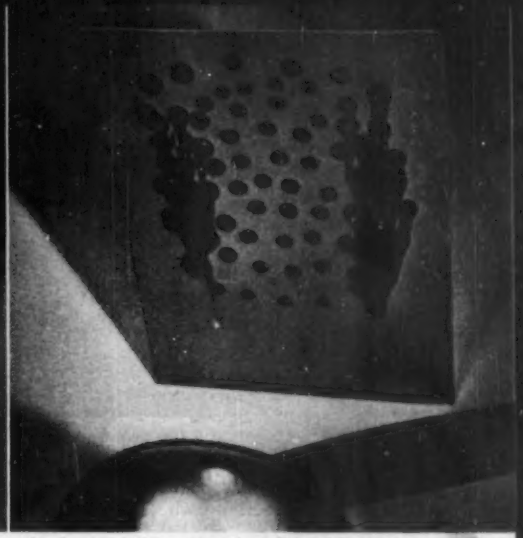
OLD as sunlight, radiant heat is the key principle in the latest broilers and home-heating systems. With inexpensive reflector bulbs, it's at your command to do such heat tricks as keeping you warm in a cold room or drying paint from the inside out.

What's different about it? Touch a red-hot poker and conducted heat tells you about it. Above a radiator, you feel a warm air current—convected heat. Ride past a bonfire in a train and you feel a flash of warmth, gone in a split second. That's radiant heat, traveling with the speed of light.

Radiant heat is transmitted as electromagnetic waves, the same as light, radio and X rays. These waves cross the immense vacuum of space between us and the sun. They also pass unchanged through anything transparent to them (air for instance), so the coldest winds can't cool them. But when they hit something opaque, they are absorbed, made to release their heat energy, and things get hot.

Prove it with bulbs. You can demonstrate the difference between radiant heat and other forms with one or two 250-watt reflector infrared bulbs, or even ordinary store-window reflector bulbs, which radiate plenty of heat energy. And when you're through with the experiments, put the lamps to the practical uses shown on a following page.—*Kenneth Swezey, Brooklyn.*





HEAT SHADOW Like light, infrared rays travel in straight lines. Therefore objects that block them will cast shadows outlined in heat. Dot a piece of cardboard with candle wax all over and set it up in front of a lamp, with a strip of cardboard between as at left above. Soon the wax dots on either side of the shadow cast by the strip will melt, while those in the shadow remain firm. That's why beach umbrellas temper the sun's heat.

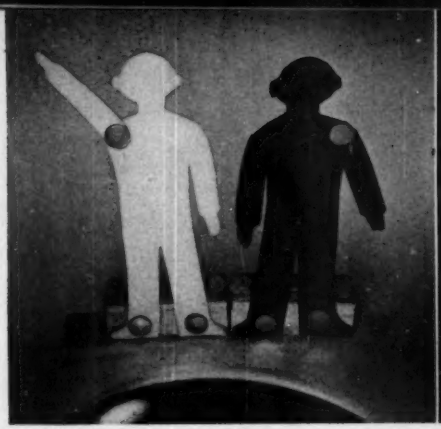
GREENHOUSE Some things are more transparent to one wave length of infrared radiation than to another. Glass, for example, passes short waves from hot sources like the sun, but blocks longer infrared waves from bodies that are only warm. Radiant heat readily enters a greenhouse to warm soil and plants, but can't escape back through glass, because it has been transformed to a lower temperature at a longer wave length.

Wind cloth around a thermometer to make a tight seal in the neck of a milk bottle. Turn an infrared bulb on the bottom of the bottle. The air temperature will keep rising, although the glass and the air inside are heated slowly, because they lose heat even more slowly. Radiations from the warm air are too long in wave length to get out through the glass.

POPPING CORN Your friends will be almost too surprised to eat this popcorn when they see it popped in cellophane. Wrap some popping corn in clear cellulose tissue from a bread wrapper or pack of cigarettes and suspend the bag between two infrared lamps so that it touches neither of them. The corn blocks and absorbs the infrared rays and therefore becomes hot. Cellophane, almost transparent to the rays, stays comparatively cool.

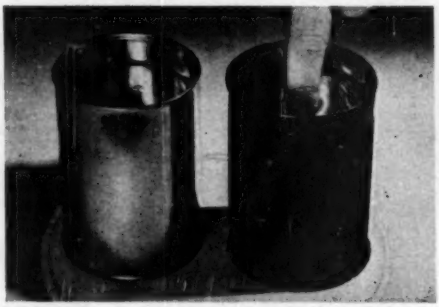
REFLECTION You can reflect radiant heat just like light. A shaving mirror or even a sheet of bright metal set at an angle in front of a bulb will direct the heat wherever you like. The bulbs themselves contain a parabolic reflector, made by silvering the glass shell. You can make home radiators more efficient with aluminum foil behind them to reflect heat into the room.

Please turn the page for more stunts.



CLOTHING How much the sun warms you depends largely on the color of your clothing. White and light-colored clothes reflect radiant heat away from you, help keep you cool. Dark ones absorb it, making you warmer. One of these mannikins is cut from white cardboard, the other from black. A separate arm is stuck to each in an upraised position with a thumbtack and a drop of wax between.

When both figures are put in front of an infrared lamp, the fellow in black drops his arm before the one in white, as at left above, for the dark one absorbs heat faster. Put both figures in an oven (right) where they are heated by conduction and convection, and both arms will drop about the same time.

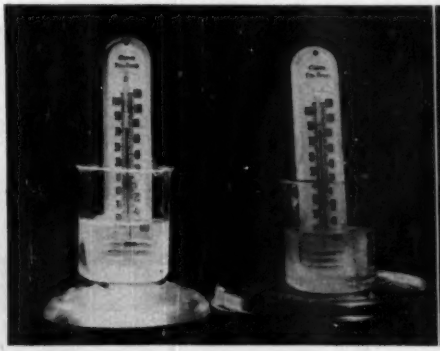


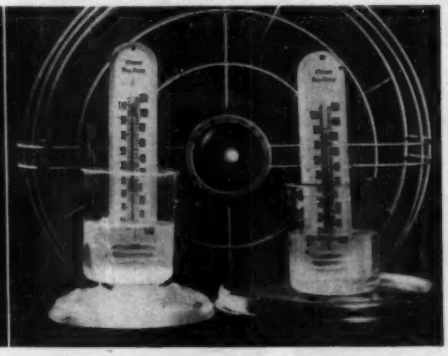
RADIATORS Anything hot is losing some heat by radiation. Surfaces that absorb radiant heat best also radiate it fastest. Those that reflect it readily are poor radiators. To show this, blacken one of two tin cans over candle. Fill both with boiling water.

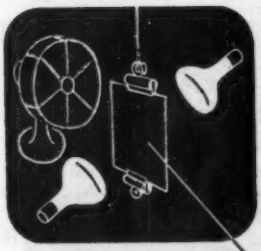
You can stick a finger in the blackened can much sooner than in the shiny one, which radiates heat away more slowly. That's why heating radiators should be painted a dull and preferably dark color for top efficiency, and why utensils used on radiant burners ought to have black bottoms to absorb heat, and shiny sides to reduce loss by radiation.

THE BIG DIFFERENCE This conclusive stunt will show you how radiant differs from convected heat. Fill two beakers with alum solution and put a thermometer in each. Place one over an infrared bulb, the other over an enclosed-top electric hot plate that has been preheated. Rest the beakers on short pieces of heavy wire to raise them above the heater surfaces a trifle.

The temperature of the solutions will soon rise, with the one on the hot plate probably gaining (left). Now set up a fan to blow through the spaces under the beakers (right). Almost instantly, the thermometer over the hot plate stops rising and soon goes down. Convection is disturbed by the draft, and heat no longer reaches the solution. The other thermometer keeps on, for air has no effect on radiant heat.







10 Uses for Infrared Bulbs Around the House

1 Film dries fast between two bulbs 18" apart. Fan prevents overheating and speeds evaporation. Harden the film in chrome alum before drying.

2 Quick meals. A bulb will thaw frozen foods in a hurry. It's a lifesaver when guests are coming or supper has been started late.

3 Take chill off bathroom with heat-resistant lamp in wire guard. These are made for use in spots where spattering water might break other kind.

4 Soften up paint for removal with a bulb held close. Then scrape it off. This won't work on painted metal, however, or on heatproof paint.

5 Paint and touch-up jobs done with lacquer or enamels (not with oxidation-drying paints) dry hard quickly under lamps, and pick up less dust.

6 Tell the girls they can be on the dot for dates by using a heat bulb and a small fan to hurry drying when they wash their hair or apply nail polish.

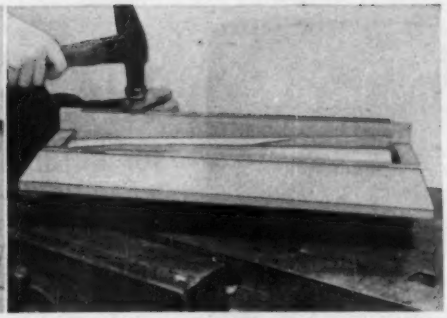
7 Cold-morning starts are easier on your car if you warm the carburetor first. A bulb aimed at the crankcase will also keep oil fluid.

8 It's an art to turn out inked drawings in a rush. A heat lamp dries ink fast. Erasing and crosshatching can thus be done right away.

9 Work in a barn or other cold place? Infrared lamps won't heat it, but will keep you cozy if you spot them right and stay in the beam.

10 Thermoplastics bend readily if heated in an infrared beam. Heating can be restricted to a small area with a shield as shown here.

The dispenser can be fastened inside a drawer with angles. Place it so the cutting edge is level with the lip of the drawer.



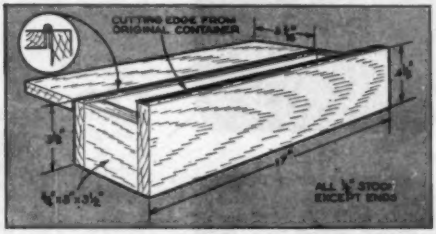
The top edge to which the cutter is nailed is ⅛" higher than the cover. Raising the cutter makes it easier to pull and tear the paper.

Wooden Container Dispenses Kitchen Paper from Drawer

You only need use one hand to get a sheet of kitchen paper from this box. It is screwed inside a work-counter drawer to hold it down while you pull out the paper.

The dimensions given in the drawing are for paper rolls 15" long by 2½" in diameter. For rolls of a different size, make the inside of the dispenser the same dimensions as the outside of the carton in which the paper comes.

The dispenser is made entirely of ½" stock except for the two ¾" endpieces. The cover, which clears the backpiece by 1/16", is attached with ⅛" hinges; the other parts are glued and nailed together.



The paper knife, the metal cutting strip from a roll's original container, is nailed to the top edge. This edge is made ⅛" higher than the cover so that when a sheet is torn off, a starting strip for the next is automatically left exposed.—*Walter Haase, Hartford, Conn.*

New Unit Spreads Rain Water

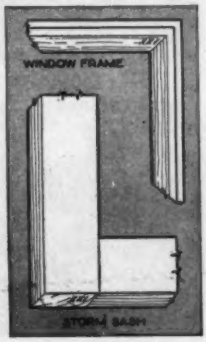
Placed under a downspout or outdoor faucet, this concrete unit fans out a stream of water, keeping it from digging a hole in a lawn or flower bed. A steel web embedded in the concrete makes the spreader virtually unbreakable. It's priced at $1.75 by Picone Bros., of Brooklyn, N. Y.

Envelopes Make Photo Hinges

Glued flaps on unused envelopes that come as mail enclosures can be turned into photo hinges. Cut rectangular pieces from the adhesive flap, fold them, and the hinges are ready.—*Pat Fey, New York City.*

Staples Identify Storm Sash

Here's an easy way to mark wooden storm sash and screens so you'll get the same ones on the same windows next year. Use a heavy-duty stapler to make Roman numerals in the sash and window frames. Brush varnish on staples to prevent rust.—*S. P. Giebelhaus, North Edmonton, Can.*



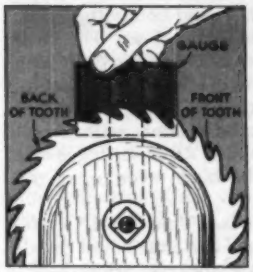
How to Sharpen Circular Saws

When a blade begins to munch through wood like an elderly beaver, it's time to unlimber a file and touch it up.

By Edwin M. Love

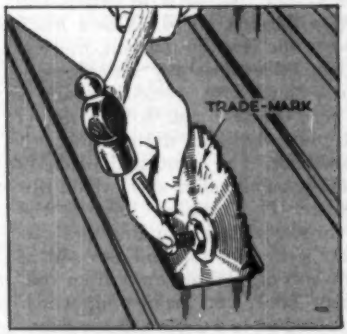
UNTIL science perfects non-dulling steel, circular-saw blades will have to be filed now and then. Don't put off sharpening them. A dull blade puts the brakes on your motor, overheating it, and may pop a fuse. Besides, the slow, rough cutting wastes time.

Jointing. As smooth performance depends on every tooth doing its share of cutting, all the points must be equidistant from the center. Jointing, or rounding a blade to even the teeth, is easily done. Adjust the blade or table so the points just graze a whetstone resting on the table insert, start the saw, and pass the stone over the insert

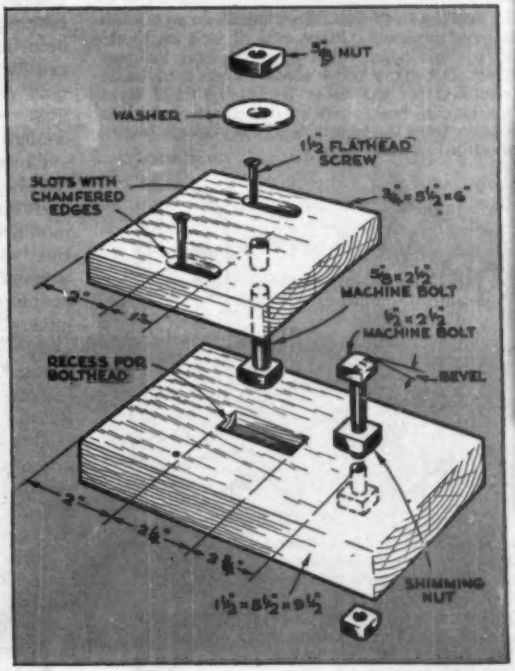


1. Maintain original tooth shape. Make a metal template, as shown at left. Trace the tooth form on the head. When sharpening the blade, follow the template to maintain tooth shape.

2. Jointing the blade. Adjust blade so teeth barely project above table. Run the saw and pass edge of oilstone over the blade (right). Teeth should just graze the stone. Each tooth should be slightly flattened. If not, raise blade a little more and make another pass with the stone.



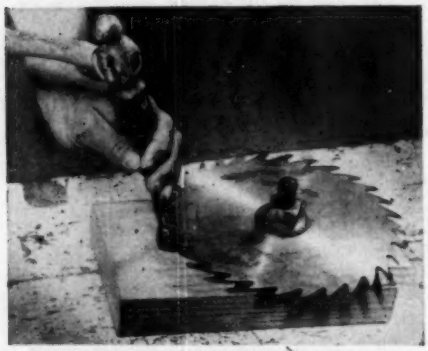
3. Centering the blade. Before removing blade from arbor, turn it so trade-mark is up. Make prick-punch mark on arbor (above). Always mount blade with punch mark and trade-mark up. Replacing blade in any other position than one it was jointed in would make it run off center if hole in blade is slightly larger than arbor, or if arbor is sprung.



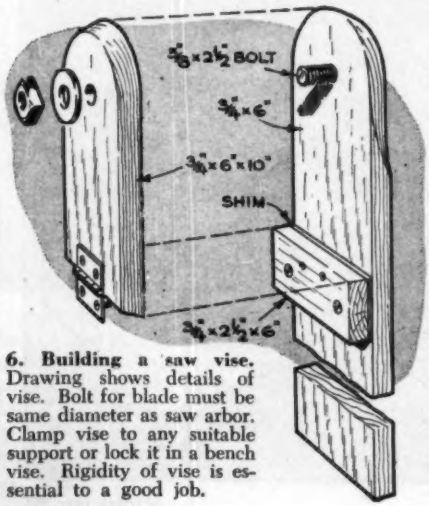
4. Making a setting tool. Drawing at right shows how to make a setting stake. The ¾" by 5½" by 6" block shims up blade and permits adjustment for size of blade. Bolt for blade must be same size as hole in blade.

slit. If examination of the blade after it comes to a stop shows that all teeth weren't slightly flattened, repeat the operation with the blade raised a trifle. Before removing the blade, turn it until the trade-mark is up and make a prick-punch mark on the end of the arbor at the top, so you can replace the saw in the same position.

Most blades are spring set—the tips of the teeth are bent alternately to right and left to cut a wider kerf than the saw thickness. This reduces side rubbing. You can measure the amount of set very simply. Stand a try square on the table top with the outer edge touching a tooth point set to that side. Then slip a thin wooden wedge between the square and the saw. Mark the wedge where it won't go in any farther, and measure its thickness at that point. This is the set.



5. Setting the teeth. Position blade so a tooth is over the anvil. Place end of bolt on tooth. Strike bolt head with light but firm hammer blow. Set every other tooth. Then turn blade over and set the other teeth. Teeth of light blades can be set about one-quarter of their lengths from the points. Set heavy-gauge blades one-third of their depth.



6. Building a saw vise. Drawing shows details of vise. Bolt for blade must be same diameter as saw arbor. Clamp vise to any suitable support or lock it in a bench vise. Rigidity of vise is essential to a good job.

Before filing, it's a good rule to make a T-shaped template of thin metal or plastic, the shank of which is notched to fit against the arbor while two or three teeth are traced on the head. Cut along the line or blacken the silhouette, and use it to check the teeth when filing them.

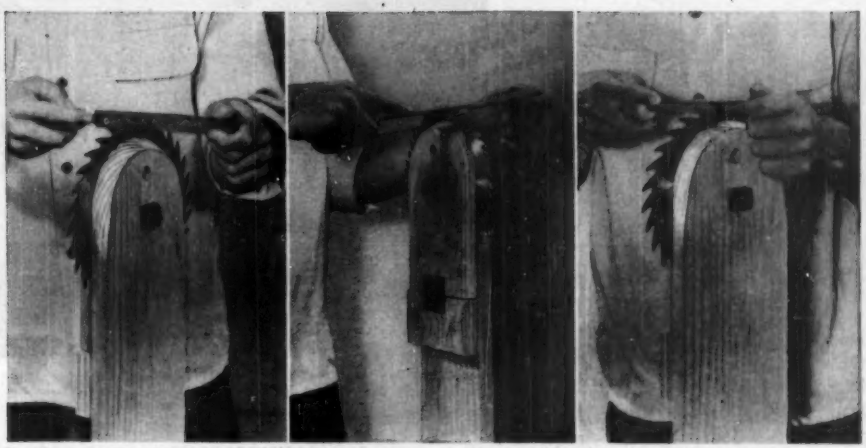
Setting. You can make your own setting tool. A bolt fastens the blade to a block of wood screwed to a base block that holds the anvil. The anvil is a second bolt with half its head beveled to the angle of set. The anvil bolt is adjusted so that its head is flush with the under side of the blade. With this setup, the blade can be turned so that a tooth lies on the anvil, to be bent down with a bolt driven with a hammer. After setting every other tooth, turn the blade over to set the remaining ones.

Making a saw vise. This is a 1″ by 6″ board rounded at one end and bored to admit a bolt the size of the saw arbor. Make a short front jaw, boring it to match and hinging it to the first board. With a blade held between the jaws by the bolt, the vise can be clamped against any suitable support, or in a bench vise, while the blade is filed. Be sure the saw vise is held rigidly enough to prevent chatter during filing.

Combination. The most-used blade in the shop is the combination saw, which rips and crosscuts. The simplest form is the modified rip saw. After rounding and setting, clamp it in the vise and file square across the fronts of teeth set away from you, keeping the "hook," or inclination, which generally is tangent to a circle half the diameter of the blade. Use an 8″ or 10″ mill bastard file with round edges, cleaning the gullets, or tooth bottoms, as you go. Then get the feel of the top bevel of the tooth by resting the file on it, and file to a bevel of 5° across and 19° sloping toward the back, stopping when the jointing flat at the point is gone. Reverse the saw or the vise to file the remaining teeth.

After several filings the gullets must be lowered with a round file turned as it is stroked forward. Strike a guide line on the blade by marking with a pencil as the saw turns on the arbor.

Novelty. The novelty type of combina-



7. Sharpening a combination blade. Use 8" or 10" mill bastard file with round edges. File fronts of teeth (left) first. Sharpen teeth set away from you. Reverse blade to file the others. Leave a little of the flat spot made in jointing as a guide to filing the back of the teeth. Check with your template from time to time to maintain tooth shape. When filing backs of teeth (center) stop filing as soon as the jointing flat disappears. Otherwise, the tooth will be short and it won't cut. From time to time, shape the curved backs of the teeth (right).

tion blade has groups of four crosscut teeth with a rip or raker tooth. The raker is filed square and from 1/64" to 1/32" shorter than the others, and has no set. The crosscut teeth are beveled on alternate sides, the fronts, 18°, the backs 12°, with the fronts radial.

Hollow ground. A planer, or hollow-ground, saw is filed like the novelty saw, but has no set. As fronts and backs of the teeth must be filed separately, a cant file—a triangular file with two sides longer than the third—should be used. If an ordinary taper or blunt saw file must be used, be careful to press only on the tooth being sharpened.

Rip. Rip saws are filed like combination blades, but the backs are usually filed square across. Generally the teeth are larger.

Dado. Dado saws must be jointed as a set, so that the head will cut grooves that are as deep at one side as the other. Count the number of file strokes. The saw blades are not set and are filed with the handle held low, giving a sharp bevel to front and back, 40° and 20°. The fronts slope back at an angle of 20° with the radius. File the tops of the chippers, keeping them 1/64" short.

Crosscut. Shops with much crosscutting work find a crosscut saw desirable. It is filed essentially like the cutoff teeth of the novelty saw, but the gullets are deeper, with the angle between teeth about 50°. Bevel 10° front and back for hardwoods, 25° front and 15° back for soft woods. END

A scale-model Jaguar that runs on electricity is next month's project for modelmakers.

8. Novelty blade. Teeth of this kind of blade are set; those of a hollow-ground blade are not. They are filed alike. A cant saw file is best, but a taper or blunt file will do. File the front of a tooth and then the back, following your template to keep the proper tooth shape.

Radiator Cover Hides Handy Clothes Drier

Bad weather needn't affect your wife's washday schedule. This indoor drier costs little to build and nothing to operate.

Clothes dry fast and clean and their moisture helps to freshen and humidify the air in the room. The drier holds a lot of wash.

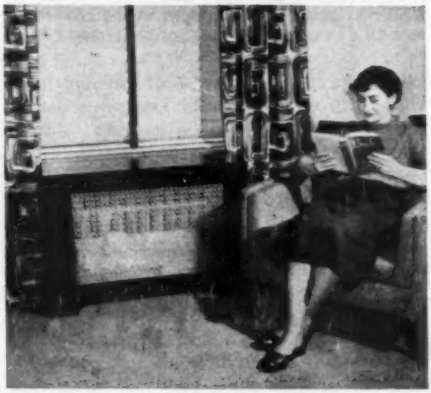
YOU can have this clothes drier without straining your budget. It's a good-looking radiator cover that conceals the plumbing in your living room and also gives your wife a place to quick-dry small laundry for six or seven months of the year.

It consists of an inner frame on which a clothes rack slides up and down, and an outer cover that encloses the frame. The unit shown was made to go under the lip of a window sill. If this should bring yours too close to the top of the radiator, you could make it flush with the sill.

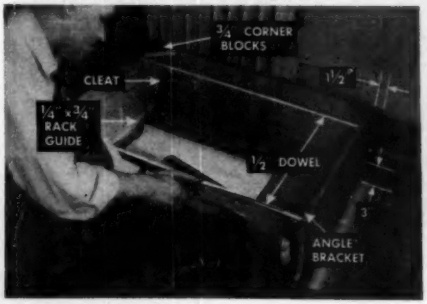
Build the frame to enclose the radiator, including the valves, with a 2″ margin all around. Make the cover at least 1″ higher and wide enough to fit easily around the overhanging top of the frame.

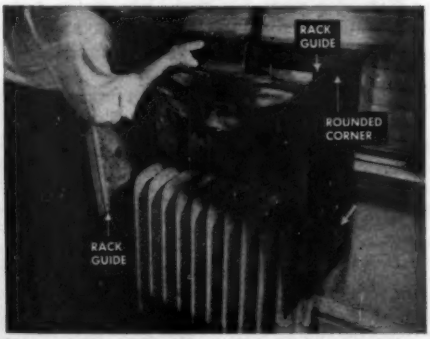
In the front of the cover, cut an opening

Laundry is hidden too. Only difference in the appearance of radiator cover is that it extends out a few more inches when clothes are in.



Open frame, 2″ higher and longer than the radiator, has a top 3″ narrower than the sides, but overhanging them 1½″. Secure dowel crosspieces with one wood screw in each end. Attach reflector paper to lower dowel with staples or by squeezing in tacks with pliers.





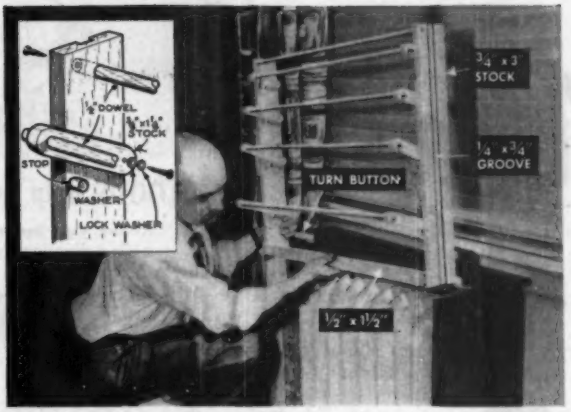
Place frame over radiator, pulling pipeless end away from wall if necessary. Secure to baseboard with angle (arrow). Tack upper end of reflector paper to underside of the top.

to leave a 3"-wide frame at the top and sides, and 6" at the bottom. Then cut a 3"-high notch up from the bottom as a cold-air inlet. Cover the big opening with decorative screening or perforated metal, and frame it with ½" quarter-round molding.

The rack rails are ½" dowels through pivoted wooden arms. The rails must be staggered so that clothes on top won't cover those lower down. This is done by making each pair of arms 1" longer than the pair next above it.

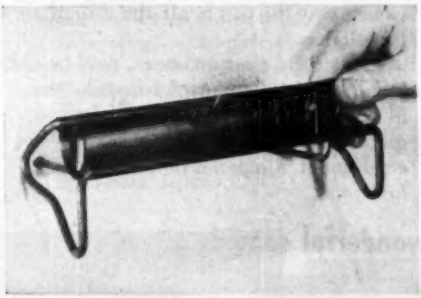
As a cover tends to reduce heating efficiency, it's well to add a reflective backing to direct heat outward. You can buy reflector paper made just for the purpose or else use aluminum cooking foil.

Tack reflector to back of the frame, and then slide the frame behind the radiator and fasten it to the baseboard with angle brackets. Fit the clothes rack into the rails, and push the front cover over everything. The unit will add to the appearance of your room even while it's making itself useful drying the wash.



Rack has grooved sides to slide on guides, with a dowel crosspiece at the top and a flat one below. Shellac sliding parts to keep them from absorbing moisture, and wax well. Turn buttons on top of the frame swing under pivot arms of lowest rail to hold rack up, making it easier to hang clothes.

Soldering Equipment Hangs Up



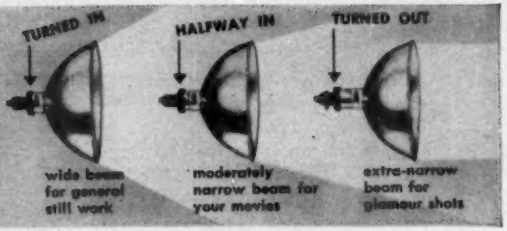
You can make your soldering-iron stand do double duty. Mount it on the wall with screw hooks, as shown, and it'll serve as a rack for iron and equipment. Make sure the iron is cool before placing it in the rack. The stand is easily lifted from the hooks whenever you have soldering to do.—*John J. Rea, Urbana, Ill.*

My Most Ongenious Solution

After I had tramped around to several stores trying in vain to buy replacement knobs for radiator valves, I hit on a very good substitute. What did I use?

Ordinary rubber coasters—the kind that are used under the legs of furniture. After I removed the broken wooden knobs, I drilled small holes in the center of the coasters. The machine screws that held the wooden knobs now hold the coasters in place on the valves.—Neal Flanagan, Brooklyn.

Bring the Sun Indoors



FLOODS help make superb indoor pictures

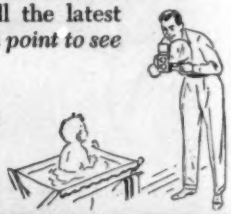
Kodak Vari-Beam Standlight—You get powerful, controlled illumination with 12-in. reflector, No. 2 flood lamp. Easy aiming with convenient handle. Column adjusts from 3 to 5½ ft. Rubber rim on base protects furniture. $16.

Kodak Vari-Beam Clamplight—has the same controlled beam features of the Standlight Unit, but is mounted on a bracket for securing to backs of chairs, table tops, and tubular surfaces. $10.50.

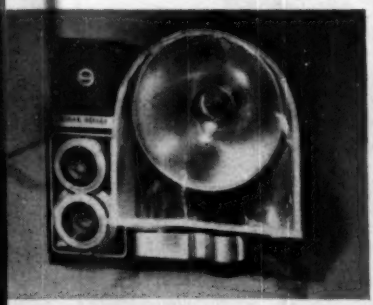
for some of the best snapshot opportunities

Some of the best picture-taking situations happen indoors—*right inside your family circle!* The Kodak lighting equipment shown on this page will help you capture those shots whenever you want. Maybe it's an informal one of "Sis" in her first evening dress. FLOODS are the answer, of course. Or maybe it's baby playing in his bath. What easier way to catch all the fun than with FLASH!

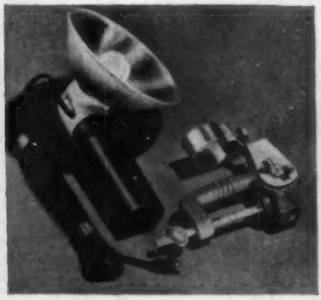
Practically every camera, new or old, can be adapted to indoor picture taking. Your Kodak dealer will be glad to show you all the latest equipment. *Make it a point to see him soon.*



FLASH helps catch those wonderful candids



Kodak Flasholder, Model B—fits most cameras with flash shutters. 2-way Flashguard offers protection in case lamp shatters . . . produces soft illumination for indoor color shots. Price, complete, $12.35.



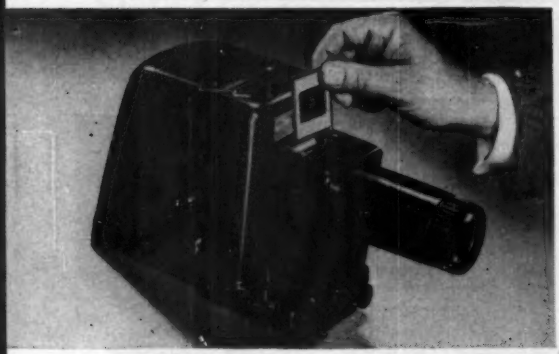
Kodak Flasholder Extension Unit, Model B—connects to Flasholder on camera, gives you multi-unit illumination for more natural-looking flash pictures. Attach to flat or tubular surface. $13.65.

Kodak B-C Flashpack—dependable "flash." Use in place of two "C" batteries in flash unit. 22½-volt battery in Flashpack charges condenser for abundant energy to ignite lamp. $2.95 (without battery).

Color ... one of the biggest thrills of all

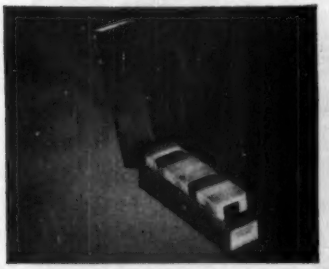
The beautiful projected image in full color is one of the most satisfying rewards of taking pictures with Kodachrome Film. Here you see some of the latest Kodak equipment and accessories for projecting, viewing, and storing Kodachrome slides.

Your dealer's experience and advice can prove invaluable. Don't hesitate to ask him questions. Answering them is his business. Enjoy one of the biggest thrills of all in photography—*pictures in color!* See your Kodak dealer today.



New, low-priced slide projector—Kodaslide Merit Projector is big news because of its new, improved slide-feeding mechanism. You simply insert slides in *top* of projector—thus no jarring or moving of instrument. Cool, large-sized lamphouse of unique design to keep slides flat . . . built-in elevating mechanism . . . Lumenized Kodak Projection Ektanon Lens, 5-inch *f*/3.5 . . . powerful 150-watt lamp . . . *all add up to real value for only $24.50.*

For convenient showings to small groups—Kodaslide Table Viewer, 4X, combines projector and screen in one unit. Think of the convenience—a complete show right in front of you—no rearranging of furniture, no dimming of lights. Switch it on and you're ready for a color show. You see your color slides beautifully enlarged more than 4 times. $49.50. Accessory carrying case at a small extra charge.



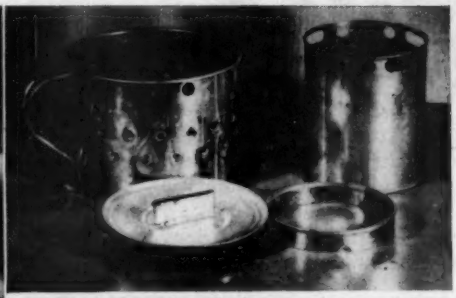
Keep slides protected, organized—Kodaslide File Box is a sturdy metal box that holds 150 cardboard slides or 55 glass slides. Separators for group filing. $1.50.

12 swing-out compartments in the de luxe Kodaslide Compartment File hold 240 cardboard or 96 glass slides. You'll like the handy index inside the cover for listing slides by subject. $3.75.

Prices subject to change without notice and include Federal Tax where applicable. Consult your dealer.

EASTMAN KODAK COMPANY, ROCHESTER 4, N. Y.

Kodak



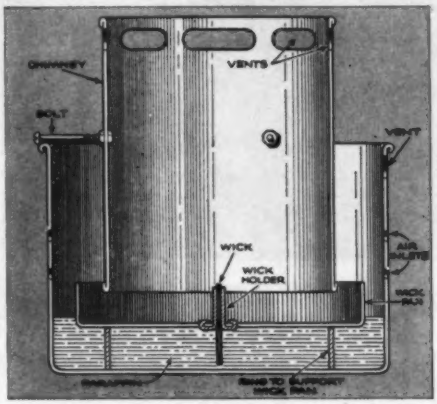
Stove (tin cup) and chimney (tin can) have ventilating holes punched in them. Arm bolts on chimney let it rest on sides of stove. For greater heat output, two wicks can be used.

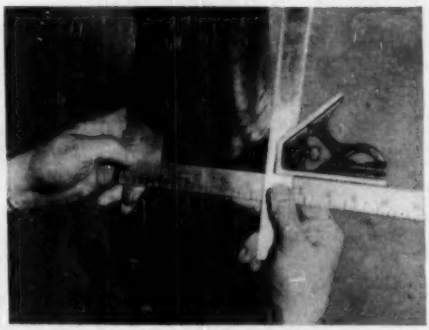
Camp Stove Burns Solid Fuel

You're not likely to spill the fuel out of this stove when you take it camping—it burns paraffin, a solid except when burning.

Made mostly from a large tin cup and a tin can open at both ends, the stove is easy to build. Details are shown in the photos and drawing.

The wick pan is a coffee-can lid to which the wick holder can be soldered or attached by tabs that are clinched in slits. Use a piece of folded asbestos paper for a wick. It should extend below the holder, almost to the bottom of the fuel reservoir. When the stove is cold, light it upside down.—*Walter E. Burton, Akron.*





Squares Measure Big Pipe

It's sometimes necessary to measure pipe that's too large for average calipers and that's installed so it can't be measured across the end. The problem can be solved by using a small carpenter's square and a combination square. Used as shown, the two squares give an o.d. measurement accurate enough for most purposes.—*Will Thomas, Buffalo.*

Peach Basket Dries Brushes

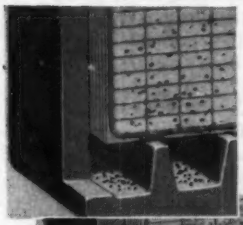
To drain and dry my paint brushes after I clean them, I just poke the handles through the gaps in a peach basket. It works fine.—*H. Graeter, Blairstown, N. J.*

Joining Separated Mercury

If a thermometer is severely jarred or jolted, the mercury column sometimes separates, affecting the temperature readings.

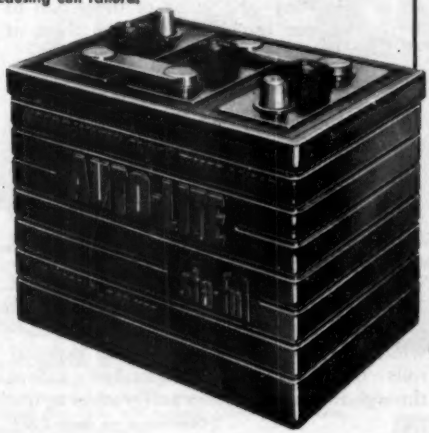
The column can be joined again by cooling the thermometer with dry ice until the mercury has contracted into the bulb. Apply the dry ice slowly at intervals to prevent the mercury from freezing in the tube before reaching the bulb. Now allow the thermometer to warm slowly in a vertical position so that no gas is trapped in the bulb as the mercury expands.

The inside story of your battery- See how it works!

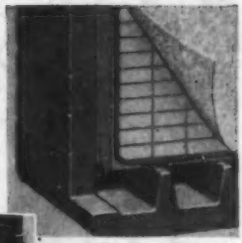


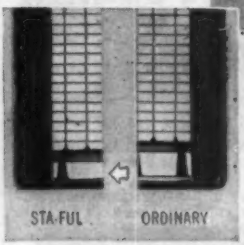
1 In ordinary batteries, small particles keep flaking off positive plates, so ordinary design batteries must have large sediment wells at bottom of case to hold these particles.

2 If sediment wells in ordinary design batteries aren't big enough to hold flaking particles from positive cells, particles pile up and short circuit cells, causing cell failure.

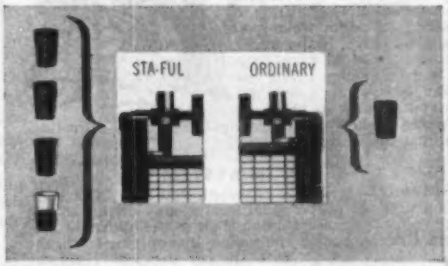


3 In the Auto-Lite "Sta-ful" Battery, every positive plate has a Fibreglass retaining mat protecting it and holding the active materials in place to reduce shedding and flaking.





4 Side-by-side view shows that the "Sta-ful" Battery doesn't need all the extra space at bottom as ordinary design batteries do. So extra space in "Sta-ful" Battery is moved to top where . . .



5 . . . extra space can be used to hold more battery electrolyte, giving room for over 3 *times the liquid reserve* in the "Sta-ful" as in ordinary batteries. That's why the "Sta-ful" needs water only 3 times a year in normal car use. "Sta-ful" Batteries give longer life, too, in tests conducted according to minimum life cycle standards.

AUTO-LITE BATTERY CORPORATION

Toledo 1 Ohio

Auto-lite sta-ful ...needs water only 3 times a year

IN NORMAL CAR USE

Care and Feeding of Engines

BY S. P. CORP

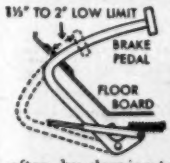
WHEN BRAKES DON'T BRAKE

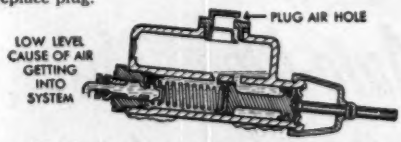
You're rolling merrily along. There's a stop sign ahead, for a main highway. You put your foot on the brakes. Nothing happens. For a few sickening seconds you go along with your heart in your mouth. You pray there isn't a car coming. There isn't. But there might just as well have been.

To keep this from happening, check your brakes often. Watch the position of the brake pedal when you stop quickly. If the under side of the pedal is less than 1½ to 2 inches from the floor, your brakes need adjusting. If you have to "pump brakes" to stop, your brakes need adjusting. Adjust the shoe of each brake.

AIR IN SYSTEM

Even after brakes are adjusted, you may have stopping trouble. If the pedal feels spongy or soft as you step on it, you probably have air in the hydraulic system. Check for air in the system by applying the brake with the car stopped. Hold the pedal down for a few seconds, then apply a little more pressure. If it moves down again, or feels spongy, you have air in the system, which must be removed by a bleeding operation at any good service station. Air gets in when brake fluid gets too low in the master cylinder. Check this level often, by cleaning top of cylinder and removing plug. If fluid is lower than ½ inch below top of cylinder, add fluid. See that air hole in plug is clean, then replace plug.





IF YOUR CAR SMOKES TOO MUCH

A smoking exhaust means your engine is wasting gas and oil, and needs new Sealed Power Piston Rings. The Sealed Power MD-50 is the best steel oil ring ever made. It controls oil even in badly tapered and out-of-round bores. Your dealer has Sealed Power Rings or can get them for you. A postal to Sealed Power, Dept. H-10, Muskegon, Mich., will bring you free helpful book, "7 Ways to Save Oil."

He Turned a Hobby into Big Business

[*Continued from page 133*]

In July 1934, Leo and Carrie moved into the building at Fifth Avenue and 42nd St. where Zeiss had their U. S. headquarters. By this time Leo's brother Si had joined the organization. Extra care was still the secret of the Pavelles' growing success—the only one, really—but the discriminating camera shops in the greater New York area were beginning to know about it. Several of the largest began sending all their fine work to 16 East 42nd St. (where Pavelle Laboratories, Inc., still are located).

Tint Trade-Marks His Work

Leo had always tinkered with the enlargers, redesigning and rebuilding them in his own machine shop—installing high-intensity quartz mercury lights to obtain 20- to 30-diameter enlargements in a matter of seconds, adding devices for removing dust from films, experimenting with new light sources. Also, to protect himself against occasional accusations of poor work that he had not done, he introduced into the fixing bath a blue-green dye about the hue of his serious eyes. This faint tint became his trade-mark, and still distinguishes his work.

World War II brought the Pavelles a new kind of problem. The United States government suddenly wanted 8 by 10 prints on the order of 15,000 to 20,000 a day. For example, the hush-hush Office of Strategic Services had an exacting job: it had requested citizens of the U. S., its allies and friendly neutrals to send in personal snapshots taken in any of the European, African or Asiatic areas where OSS was or expected to be operating—and many of these had to be copied and retouched to make them at all useful.

How to Make Good Enlargements Fast

The problem became one of fast quantity production with uniform high quality. Pavelle shut himself in his machine shop and came up with photoelectric cells to time the exposures for uniform results, and controls that determined exposure, relative accent on subject and background, and other variables. That development eventually led to exposure on 250-foot rolls of sensitized material and the first continuous black-and-white equipment that carried the exposed rolls on tandem, friction-braked rollers through the various baths and washes to the

[*Continued on page 246*]

If You Own a

PONTIAC...

AC Spark Plugs, with patented CORALOX Insulator, Were Engineered Especially for You

For many years, Pontiac engineers have looked to AC for spark plugs which perform perfectly in Pontiac six- and eight-cylinder engines, under all operating conditions.

Naturally, the plugs they specify for all Pontiac engines are the newest AC Spark Plugs, with patented *CORALOX* Insulator.

CORALOX contributes to driving pleasure by making spark plugs perform better and live longer. It greatly resists fouling. Consequently, it ensures easier starting and surer firing, whether the engine is hot or cold.

CORALOX brings these advantages to owners of *all* Pontiac cars, past models as well as present.

AC Spark Plugs, with patented *CORALOX* Insulator, are therefore the logical replacement plugs for all Pontiac owners who want the utmost in spark plug performance.

IF YOUR CAR ISN'T A PONTIAC

you can also have the superior performance ensured by CORALOX. AC's immense engineering staff has worked with the engineers of most engines built in America. Therefore, there is an AC Spark Plug type, with patented CORALOX Insulator, engineered for your engine, too.

AC SPARK PLUG DIVISION GENERAL MOTORS CORPORATION

OWN THE FINEST!

Starrett

SATIN CHROME* MICROMETERS

Pioneered and Developed by The L. S. Starrett Company

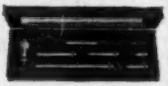
Often imitated, never equaled, Starrett Micrometers are the standard by which all others are judged. Precision made throughout by Starrett methods based on over 70 years of micrometer manufacturing know-how . . . plus 12 big features for better, faster precision measuring. Ask your distributor to show you these finest micrometers ever to carry the Starrett name.

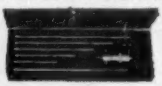
* No-glare, rust resisting *Satin Chrome Finish* is standard on thimble and sleeve of all Starrett micrometers and also on frame of all full finish micrometers.

SATIN CHROME MICROMETER NO. 230
Range 0-1" by .001". Also available as No. 231 reading by .0001".

BLACK FRAME MICROMETER NO. 436
24 sizes from 1 to 24". Available singly or in sets with .001" or .0001" graduations.

INTERCHANGEABLE ANVIL MICROMETERS NO. 224
Ranges 0-4, 2-6, 6-9, 6-12, 9-12, 12-16, 16-20 and 20-24 by .001". Singly or in sets.





SATIN CHROME INSIDE MICROMETERS
With hardened and ground contact surfaces. Capacities up to 32".

NO. 823 with tubular rods. NO. 124 with solid rods.

SEND FOR IT — ONLY 10¢
Starrett "Tools and Rules" Book

50 page booklet shows the right tools for any precision measuring job. 100 pictures plus helpful reference tables. Send only one dime. Address Dept. PS

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He Turned a Hobby into Big Business

[*Continued from page 244*]

cutting table. By 1943, assembly-line black-and-white photofinishing of hand-finished quality was an accomplished fact.

But events never give Leo Pavelle very lengthy breathers. In March 1944, Ansco introduced Printon, a sensitized material on which positive-transparency color film could be printed. Pavelle spent a week in Binghamton, N. Y., poking his opportunity-conscious Roman nose into every detail of the Ansco plant. He came back fully persuaded that Pavelle's brightest future was in color. But it was easier said than done, for the momentous step involved, among other things, new machines and new capital.

New Goal: 20,000 Color Prints a Day

The machines represented the greatest challenge Pavelle the engineer had ever taken on. Again, he disappeared in his machine shop. He knew that he would require two basic devices: one, a printing machine adapted to printing color transparencies by projection on long rolls of Ansco color Printon (exposures to be critical and automatically controlled, and the light source kept constant in color quality); another, a color-processing machine to carry the Printon through developing tanks, washers, driers, etc., under rigidly controlled conditions.

One year later, Pavelle Color, Inc., started producing in its huge $600,000 plant near the Hudson River on West 57th St. Into it had gone all of the Pavelles' money. But today, 175 employees (100 more probably will be added by the end of 1951) turn out as many as 20,000 color prints a day, exposing them on the new 1,000-an-hour capacity machines that feature, in addition to the photoelectric regulators and hand-operated knobs, yellow, cyan and magenta filter-wheels that offer 2,000 different combinations selected by an automatic color analyzer. Processing is done in a 120-foot room—at a temperature of 72° maintained by a special air-conditioning system that allows but one-tenth of a degree tolerance.

New Color-Negative Process Next

Teamed with Ansco, the man who makes shutterbug beginners look like pros is currently shooting for a fat share of the nation's color-picture printing. Ahead lies Plenacolor —Ansco's negative-transparency answer to

[*Continued on page 250*]

The POPULAR Line of Portable Power Tools

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Embodied in every PET portable electric tool and accessory is the excellence and value developed through advanced engineering, modern streamline design, economical manufacturing methods, and the specialization in high-quality electric tools. Each represents the finest precision workmanship and quality features that contribute to dependable performance, trouble-free service, and a new balance and ease in tool handling. The various accessories available for use with PET portable electric tools have been tested and proved in the applications recommended. They conveniently extend the use of this portable power to a variety of jobs that make for easier and better work around the home, in the shop, and on the farm.

You can buy a PET portable electric tool from your dealer with the full confidence of getting the ultimate in the combination of economy, power, light weight, balance, operating convenience, and long life of trouble-free service. Use coupon for complete details.

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¼" Drill

Full ¼" Capacity
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4" Diameter Wheels, 3500 RPM.
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Electric Hand Saw

Maximum Depth of Cut 2⅛". Adjustable for Depth and Angle of Cut. **Price $41.95**

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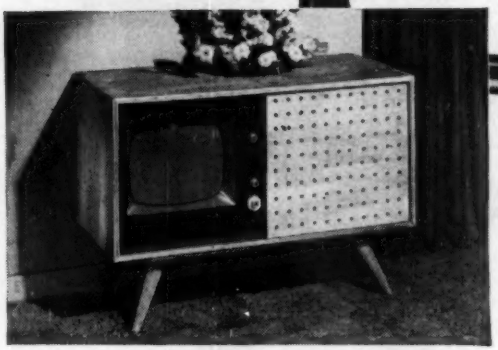

on this modern 17" television set"

"I built my own TV set. Seventeen-inch tube. Assembled chassis. Birch veneer cabinet. Modern design. The cabinet materials cost me $34.50. I figure I saved over $100. And I had the fun of doing it myself. What's more, it's just what I want in size, design and finish.

"On this job alone, SHOPSMITH saved half its own cost. I used it for everything—sawing, sanding, drilling and turning. It took me less than 60 seconds to change from tool to tool. In fact, I saved hours on jigs and adjustments, thanks to SHOPSMITH's time-saving features and precision settings.

"For accuracy, capacity, flexibility and all-around usefulness, you can't beat SHOPSMITH. It's a man-size tool, weighs over 200 pounds. Let me show you just a few of the things you can do with it."

SHOPSMITH is a complete power workshop . . .

- 8" circular saw
- 12" disc sander
- 33" wood lathe
- 15" drill press
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Five-tool unit complete except for motor*.. $189.50

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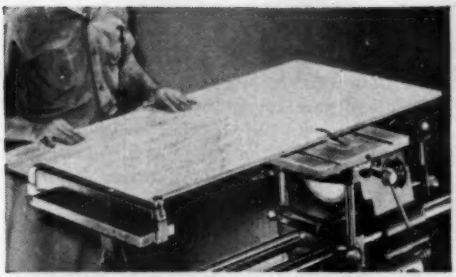
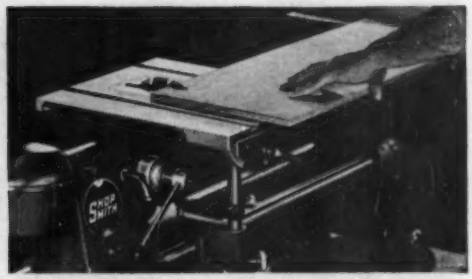
SEE SHOPSMITH DEMONSTRATED AT LEADING HARDWARE AND DEPARTMENT STORES OR ANY MONTGOMERY WARD STORE. WRITE FOR FREE CATALOG.

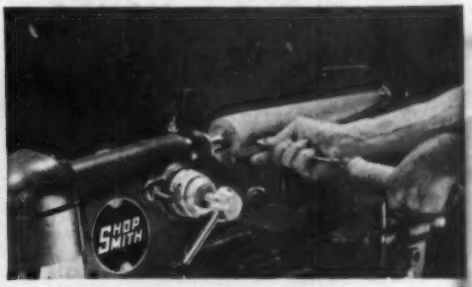


1 **"Sawing large panels.** SHOPSMITH has the capacity of a production-type saw. By putting the rip fence on the table extension, you get a maximum blade-to-fence distance of 48"—or right to the center of a standard size plywood panel."

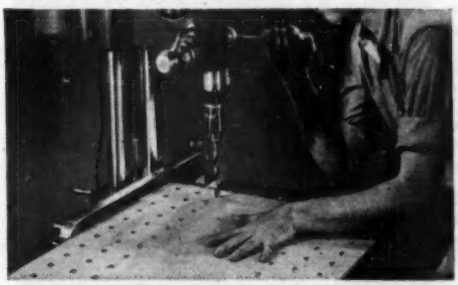


2 **"Accurate cuts** are easy with SHOPSMITH. Large miter gauge has automatic spring stops. Self-aligning fence has rugged front and back locks. For quick, accurate fence settings, the micro-quill adjustment makes hairline adjustments easy."

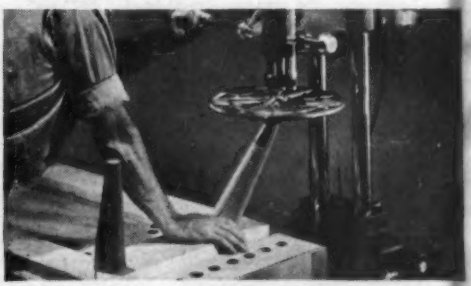
3 **"Duplicate sanding** is still another exclusive SHOPSMITH feature. You set up SHOPSMITH as a disc sander using fence and miter gauge as ready-made jigs. Set depth stop-nuts and feed disc into work. Pieces come out exactly the same length with precision-sanded ends."



4 **"It's a lathe, too!** Yes, SHOPSMITH is a heavy-duty wood lathe with 15" swing and 33" between centers. In turning pieces like the legs for my TV cabinet, the SHOPSMITH tool rest certainly proves its worth. Always slides parallel to work, and locks quickly, securely."



5 **"Parallel drilling** is another operation that's a cinch with SHOPSMITH. Rip fence serves as instant-set guide. Large table supports big work-pieces. Vertical drill press features 4" quill feed, 4 ball bearings in headstock, extra-big capacity."



6 **"Another SHOPSMITH extra.** To level legs of cabinet, I swung SHOPSMITH to vertical position, attached sanding disc and set depth stop-nuts. With workpiece upside down, I fed disc into each leg until it stopped. All legs were identical in length."

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440 Fourth Avenue, New York 16, New York

He Turned a Hobby into Big Business

[*Continued from page 246*]

Kodacolor—and Pavelle is going along for more than the ride. Recently released in test areas, and due for public distribution by 1952, Plenacolor is expected to claim its hunk of a traffic that may well approach 100,000,000 color snapshots a year before 1954.

If Leo Pavelle has any business worries he does not take them home to sons Arthur, 17, and Richard, 10. Neither does wife-partner-mother Carrie, whose black-and-white business employs 70 and is likewise about to add help.

"Mostly, I'm turning out gunstocks, or making fishing rods, or maybe tying flies or taking cameras apart—when I'm home," he says, the blue-green "trade-mark" eyes lighting up at the thought.

Just an Occasional Ride—at 120 M.P.H.

"He's a nut on sports-car racing too," an admiring assistant adds.

"Oh, I'm just a guy who likes an occasional ride in a fast job like the Jaguar," Pavelle says modestly.

"Yeah—at 120 miles an hour," the assistant mutters.

Anything else?

"Well, I'm going to teach a little next year. New course in photographic technology in the Graphics Division of the Engineering Department at Columbia. I'll handle the engineering aspects."

Wasn't he afraid of training too many rivals?

"Lord, no! We're interested in building the industry, not ourselves. We'll get our share." END

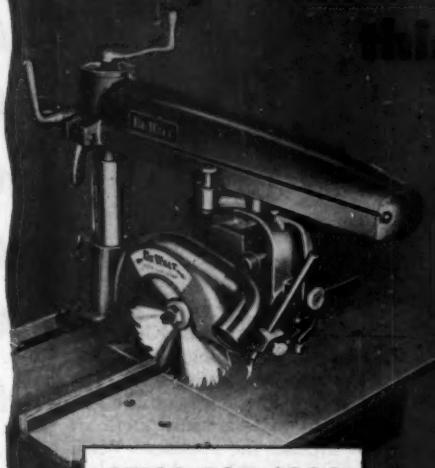
Baby Rattle Fit for a King

PROBABLY the world's most expensive rattle was the aluminum one bought for the son of Napoleon III. Its price in 1856, when aluminum was considered a precious metal, was $3,200.

Sea Sound in Shell a Phony

THE sound of the "roaring sea" we hear when holding a sea shell to the ear is caused by resonance. The partly enclosed air within the shell is made to vibrate by a harmonious, or matching, frequency of sound in the outside air. In a soundproof room, a sea shell would produce no noise.

Easy to make it yourself with this versatile, all-purpose, low-cost



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motor included

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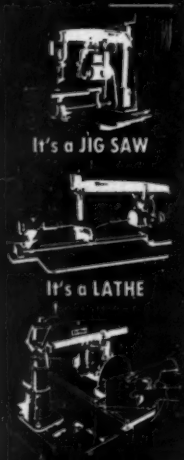

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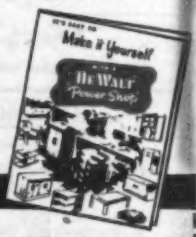
Here, in one compact, space-saving unit, is the ideal all-purpose machine for your home workshop.

DE WALT—world-famous radial power saw—works wonders with wood, metals or composition materials. It's super fast! It's super safe! In fact, it is so easy to operate and so flexible that with each quick change of a cutting tool, you have another precision machine. It's *many* machines in one!

Using this multi-purpose machine you can make any number of things with ease—cabinets, shelves, furniture, even a garage or an addition to your house!



Send for literature which describes what you can make—and the many different cutting operations you can achieve—with a DE WALT.

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Can Makes Welding Shield

A STURDY and efficient welding shield can be made from an empty gallon can. Remove one side of the can, making the cut just a little beyond the seam so that the seam is retained to reinforce the edge. Fold over the cut edges and squeeze down tightly.

Cut a 1¾" hole in one end of the can. Roll up a 6" length of the waste tin for a handle and solder the seam. Flatten and bend down one end. Push the round end through the hole from inside the can and solder tight where it enters the can and where the bent end meets the inside of the shield. Solder the screw cap to the end of the handle.

A smaller rectangular can, cut off ½" above the bottom seam, forms the glass frame. Cut out some of the bottom to make an opening for the glass. Cut a hole of the same dimensions as the frame in the face of the shield, 3" down from the top. Slit the four corners of the small can and put it through the shield. Hammer the edges over, inside the shield, and solder all around. Insert a piece of ordinary glass in the frame and then a

piece of welder's dark glass. Cut the glass retainer from the remaining waste tin, bend up the two tabs, and fasten them over the dark glass with 8-32 screws and the knurled nuts from a dry cell. Be sure there are no light leaks around the retainer. Wash off any soldering acid with washing-soda solution and paint the shield a dark color.

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WITH EVERY PUFF
YOUR PLEASURE GROWS!
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all the precision of industrial machine tools in your own home shop

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Of course, it takes precision machines to turn out accurate work. That's why smart folks buy Delta Homecraft Tools. For remember, Delta has spent years building the finest precision machine tools for industrial use. And the same accuracy and hairline precision that is required for these Delta-Milwaukee Tools is built into the Homecraft Tools *you* buy. We just don't know how to build them any other way.

So . . . buy the best . . . buy Delta . . . have machine tool precision and lifetime service in your own home workshop.

There's a Delta Power Tool for Your Job-

WOOD OR METAL WORKING

53 MACHINES—246 MODELS—MORE THAN 1300 ACCESSORIES

For Delta Dealers, see your Classified Phone Directory under "Tools".

These Delta 8" Tilting-Arbor Saw Features INSURE ACCURACY AND PRECISION

1. **Lubricated-for-life ball bearings**—keep dirt out, lubricant in
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4. **Precision-ground arbor**—assures even contact between arbor and bearings, means greater accuracy
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These excellent features, typical of Delta precision quality, are fully described in the new Delta Homecraft Catalog—packed full of valuable information and suggestions on how to get the utmost of fun and satisfaction out of your home workshop and your Delta Homecraft Tools. Send for your copy—it's free. Use the coupon.

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Jacobs Rubber-Flex Hex-Key Chucks on home workshop power tools prove that their makers put quality first.

IF IT'S A JACOBS IT HOLDS

The Jacobs Manufacturing Company West Hartford 10, Connecticut

Gus and the Missing Straddle Truck

[*Continued from page 198*]

Thatch tell you about this straddle truck?"

Gus shook his head.

"Well, between you and me, I don't think there's anything wrong with it," explained Ned. "Runs fine for me, but every time Frank—he's the driver—takes her out for a day in the yard, he brings her back howlin' a blue streak and tellin' me that she's got a bad miss."

"What does he claim it does, start to miss after it's warmed up?" inquired Gus.

Engine Runs Fine

"No, he claims it begins to miss just as soon as he gets to pushing her at all. You know these straddles take a lot of punishment—lots of lugging and lots of idling every day."

"Mind if I have a look at the engine?" asked Gus.

"Help yourself," replied Ned. "I've got other work to do."

So as Gus climbed up on top of the straddle truck and opened the hood, Ned disappeared into his shop and presently Gus could hear the noisy hiss of an acetylene torch.

Gus's first hunch was fouled plugs caused by so much idling. However, when he took out several of the plugs he found them fairly clean. Replacing the plugs, he climbed around to the driver's seat, turned the ignition switch, and hit the starter button. The engine didn't catch immediately, but when it did it ran smoothly. Although he'd never driven a straddler before, he wheeled it around the space in front of the shop several times. He thought the engine sounded pretty good.

Now Engine Misses

Just at that point, Gus noticed a young man approaching the shop.

"You Mr. Wilson?" he called to Gus. "Mr. Thatch told me to see you. I'm the driver of that truck."

Gus flipped off the ignition. "Understand this animated doodlebug has been giving you trouble," he called down.

"You can say that again. Got a bad miss, but I can't convince this dumb mechanic of ours. Here, I'll show you." He climbed up, closed the hood and slid into the driver's seat. "We'll drive her up to the yard and pick up a few boards."

[*Continued on page 256*]

TOUGH..but oh so gentle

TOUGH ON OIL-PUMPING • GENTLE ON CYLINDER WALLS

When your car first starts using too much oil, look out for worn-out piston rings. They cause oil-pumping . . . loss of power . . . destructive engine wear.

Fortunately, it's comparatively easy and inexpensive to replace worn-out piston rings—but the more you delay, the more you pay.

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Keep your car out of the DANGER ZONE

Ask your motor service man for a Danger Zone check-up. And write for the free Hastings Danger Zone booklet which shows you how to save money on engine repairs. Dept. P, Hastings Manufacturing Co., Hastings, Michigan. Hastings Ltd., Toronto.

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MAIL NOW

Gus and the Missing Straddle Truck

[*Continued from page 254*]

Even without a load, Gus could now detect a loss of power. "Mind if I drive?" he asked when they had reached the yard.

"Sure thing," said Frank.

Gus put the truck through its paces. There was no doubt about there being a bad miss every time he pushed hard on the gas.

"See what I mean, Mr. Wilson?" said Frank. "But that grease monkey we've got won't believe me, and he won't take the truck out himself and test it."

Gus Straddles a Straddle

Gus didn't answer. He was too busy trying to work out in his mind just why the engine missed now but hadn't missed before. Sliding out of the driver's seat, he opened the hood again and checked the distributor, the carburetor and the connections to the coil and the spark plugs. Everything checked out.

"Start her up, will you, Frank?" Gus called from beside the open hood.

Frank complied and again the engine took hold easily and purred along. For the next fifteen minutes, Gus peered under the open hood while Frank maneuvered the big straddle around the mill yard, picking up lumber, backing, idling, and gunning the engine.

Again there wasn't a hint of a miss. She was hitting on all six.

"Cut it," called Gus, and he just sat there staring at the temperamental engine. Suddenly he reached up and slowly closed the hood. Then he raised it, pulled it down and raised it again.

Ned Loses a Bet

"Humph," he said, digging into his left coverall pocket for his friction tape. Then he proceeded to wrap tape around the bundle of ignition wires that sprouted from the top of the distributor. "All right, now let's try her again."

This time the engine ran smoothly no matter what Frank did.

"That's got it," said Gus.

"What?" asked Frank.

"Come up here," said Gus. He pointed to a worn shiny spot on the underside of the hood. "The distributor wires were rubbing against the hood when it was closed. Pinprick leaks in the insulation were shorting

[*Continued on page 258*]

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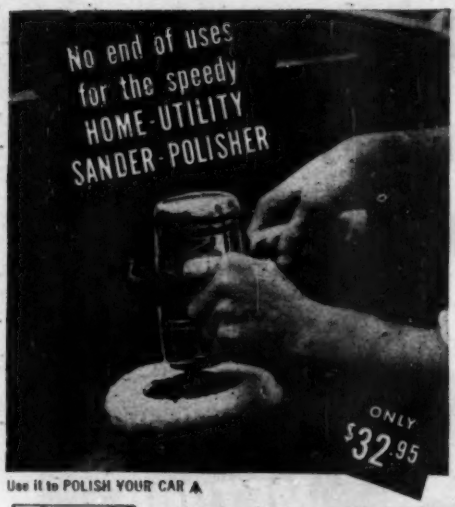

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Use it for WOOD BORING!

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Use it to REMOVE RUST!

This husky, versatile tool drives many attachments to save you time, money and muscle!

You haven't handled a really versatile tool until you've tried the Home-Utility Sander-Polisher! It comes *complete* with sanding discs, lambswool bonnet, ¼" drill chuck, cans of auto polish and wax. It drives many other attachments for grinding, sharpening, buffing, burnishing and cleaning. And it weighs only 3½ lbs., so it's easy for the whole family to use!

QUALITY-BUILT BY WORLD-FAMOUS BLACK & DECKER, this Sander-Polisher is a real tool, not a mere toy! It has an extra-powerful motor for high-speed work from AC or DC outlets. Its housing is strong, light die-cast aluminum. It has an instant-release trigger switch. Its balanced design means comfortable handling. Try it today at your hardware, electrical or implement dealer's or department store.

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ELECTRIC HOME-UTILITY TOOLS

DRILLS • LECTRO-SAWS • BENCH GRINDERS

Gus and the Missing Straddle Truck

[*Continued from page 256*]

out some of the cylinders when the wires touched the metal."

"Ha, wait'll you hear Ned howl when he hears this," said Frank as he wheeled the straddle truck around and headed for the repair shop. "This'll burn him."

"Why?" asked Gus.

"Ever since he heard you were coming out, he's had a 10-buck bet with me that you wouldn't find my miss anymore than he could. Now, he'll have to pay off and he ain't gonna like it."

Ned, however, paid off without a beef.

"Like found money," said Frank taking the two fives Ned handed him. "Here, Mr. Wilson, let me split it with you," he added, thrusting one of the bills into Gus's hand. "After all, you found the trouble."

Driver Apologizes

Gus, slightly flustered, stood holding the bill for a moment, then handed it back. "No, Frank, that was your bet, not mine."

A few minutes later as Gus started up the steps to the mill office to find Don Thatch, he bumped smack into the pickup driver coming down. He greeted Gus with a pleasant smile as the two passed.

After Gus had told Don about fixing the straddle truck he said, "What's happened to your pickup driver? Met him as I was coming in and he was almost human."

"Oh, I called him in to bawl him out about his attitude," explained Thatch, "but before I could say much he apologized for being rude to you. Said he'd had a spat with his wife this morning but he'd try to leave his troubles at home after this."

"Well, I'm ready to get back to the Model Garage any time now," said Gus. "Mind if I use your phone?"

Gus's Hunch Pays Off

"Go right ahead," said Thatch. "Use that one over there; it's an outside line. I'll get my car and meet you out front."

Gus grinned as he read the bold, black headlines that streamered across the local paper the next morning:

STATE POLICE NAB
ALLEGED BANK ROBBER

And the story went on to say:

. . . After searching the premises and finding more than $30,000 in bills stolen from

[*Continued on page 260*]

MARFAK MADE HIS CAR RIDE SO CUSHIONY HE'S SPOILED

Forget about "rough riding." Get longer lasting *Marfak* chassis lubrication, and enjoy "cushiony" driving for 1,000 miles or more! Tough, stretchy *Marfak* is made to resist wash-out, jar-out, squeeze-out. It protects against wear and friction far longer. Get *Marfak* lubrication today. See your Texaco Dealer, *the best friend your car ever had.*

MARFAK Lubrication

TEXACO

THE TEXAS COMPANY
TEXACO DEALERS IN ALL 48 STATES

Texaco Products are also distributed in Canada and in Latin America

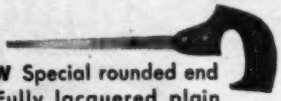
TUNE IN . . TEXACO STAR THEATER starring MILTON BERLE on TV every Tuesday night. See newspaper for time and station.

For special jobs . . . .
for hobbyists . . . .

ATKINS JR. SAWS!

Jr.-65

High speed, "*Silver Steel*"—straight back. 16" blade Perfection-pattern, apple wood handle. Identical in everything but size with one of the world's most famous saws. Also available as 18" 6-point rip saw.



Jr.-5 Keyhole Saw Special rounded end for safety. Fully lacquered plain beech handle. Perfectly tempered, flat-ground blade. Atkins "*Silver Steel*" quality through and through!

Jr.-2 Back Saw

Expertly tempered special steel for long-wearing, stay-sharp qualities. Fully lacquered beech handle. Filed and set, ready for duty for dozens of jobs in shop and home.

AND 3 MORE JR. HAND SAWS

Jr.-6, Jr.-4 and Jr.-2. Each a perfect replica of its larger counterpart. Perfect for craftsmen and women with smaller hands. Both the Jr.-4 and Jr.-2 models are available as 18" 6-point rip saws, as well as 16" 11-point crosscuts.

Only ATKINS makes products

E. C. ATKINS AND COMPANY
Home Office and Factory:
402 S. Illinois St., Indianapolis 9, Indiana
Branch Factory: Portland, Oregon
Knife Factory: Lancaster, N. Y.
Sales Offices
Atlanta • Chicago • Portland • New York

ATKINS

THERE'S AN ATKINS FOR EVERY SAWING PURPOSE

Gus and the Missing Straddle Truck
[*Continued from page 258*]

the City National Bank four months ago, a State Police raiding party headed by Sergeant Jerry Corcoran from the local barracks cornered Art King, alias Ned Hoffman, in his quarters at the Empire Lumber Mill last night. King, police believe, never spent the hot money himself, but passed it off on others by changing the bills at the mill office and by asking fellow workers to do his shopping. . .

The slam of the garage-office door interrupted Gus's reading. He turned to find Jerry Corcoran and Captain Torrence, commander of the barracks.

"Okay, private eye," joked Jerry, "how'd you do it?"

They All Slip Sometime

"Well, even though I'm not married," said Gus, "I guess I've been around enough to spot a bleached blond when I see one. Poor old Ned had been neglecting to touch up the part in his hair. Then I discovered that he sure was no mechanic, but loved to play around with a torch. The tip-off came when he settled a bet with one of the other mill hands. Just by luck, I got a look at one of the bills and the serial number matched the list. That plus the fact that he hadn't worked at the mill long and lived by himself over his shop seemed to add up to a fair hunch. That's when I called you, Jerry."

"Gus," said Captain Torrence, "during the 25 years you've been running this garage you've been a tremendous help to us many times and we'd like you to know how much we appreciate it." Torrence straightened, and a note of formality came into his voice. "We of the State Police hope you'll accept this slight token."

Gus opened the small brown leather wallet the captain handed him. Pinned inside was a gold badge with the shield of our state and inscribed: "Honorary Captain—State Police." END

Next month: Gus Gives the Air Force a Lift

What Brought About the Ice Ages?

AMONG the theories propounded by geologists for the existence of the ice ages are: changes inside the sun that reduced the amount of heat radiated; upheaval of land masses, causing abnormally large snowfalls; passage of the solar system through gigantic cosmic dust clouds that reduced the heat received from the sun; and a shift in the earth's rotational axis.

Around the clock usefulness...

CHANNELLOCK PLIERS

Made only by CHAMPION DEARMENT!

No matter what the job—plumbing, electrical, automotive or whatever, Channellock pliers are handy to have around. The patented Channellock principle permits a wide range of size adjustments without decreasing gripping power or leverage.

Channellock pliers are made by Champion DeArment—for nearly 3/4 of a century manufacturers of highest quality tools.

Dad, Mom, or the kids will find plenty of uses for Channellock pliers.

And remember—Only Champion DeArment makes Channellock.

Send for Catalog . today.

CHAMPION DEARMENT TOOL CO. • Meadville, Pa.

Channellock pliers are listed in the Yellow Pages of most Telephone Directories under "Tools"

CHAN NEL LOCK

Fill cracks in chairs—

Makes loose joints firm, sands to a smooth finish!

Reset loose hinges—

Replaces rotted wood, tightens loose screws . . . *easy* to apply!

Repairs broken toys—

Mend cracks, nicks! Smooth finish!

Also useful in filling cracks in floors, nail and screw holes, repairing loose tiles. *Handles like putty . . . hardens into wood!*

PLASTIC WOOD

A CELLULOSE FIBRE FILLER

IN CANS OR TUBES

DOZENS OF OTHER USES

How to Photograph Your Boss

[*Continued from page 216*]

angle, light, meter, shutter, exposure and the like, you'd better employ what I call the decoy system. Simply unload the task of relaxing your subject onto someone else. You recruit a good talker, someone the boss likes to listen to, from around the office or plant. Important: don't let the decoy start kidding about the picture taking. That only prolongs the self-conscious period. Instead, brief the decoy in advance, have him primed with serious and interesting topics to take up with the boss. Warn him not to pitch questions; he must do the bigger part of the talking. You want to shoot while the boss is listening, not when his mouth is open answering questions. I once photographed a president of Standard Oil, and made the mistake of asking about his trip to Alaska. His type of camera shyness took the form of answering my question for an hour.

Include Hands and Body

Before the decoy goes into action, I suggest you drag the boss's chair out from behind the desk. You're there to photograph the man, not the walnut. Face the chair toward the decoy slightly sideways to the camera (a head-on or broadside is harder to make interesting). Make sure there's no lamp, shiny wood paneling or patterned material behind to distract. Since almost the toughest assignment is to make a standard head-and-shoulders shot interesting, stay back far enough to include hands and body positions. That way you can hope for more variety when the boss gets to talking.

Don't try to pose your subject; make him pose himself. If he's accustomed to smoking, let him. If he wants to put his hands in his pockets, let him. He'll feel more comfortable—and you'll get a better picture. But don't try to make a smoker out of a nonsmoker just for the sake of an interesting picture, or hide a pair of particularly expressive hands just to get them out of the way. Let him do in front of the camera exactly what he would do behind its back, and you'll be sure of a pose that's neither stylized nor unnatural.

Lighting should be simple. Complications in lighting are all right if you know what you're doing and can clamp your subject in a vise. But tricky lighting—shooting in from the side and top—can ruin you if your subject's head moves away from its

[*Continued on page 264*]

"New-Engine" Your Car Now For As Little As $16 Down

(TERMS VARY BY AREA AND MAKE OF CAR)

***Your easy, low-cost solution** for "tired" Chevrolets, Fords, Plymouths, Pontiacs, Dodges, and other popular makes. Wizard-ized Engines are fully remanufactured in 5 large factories (not just shops or garages). Engine accessories are used from old engine, or may be replaced new.

Get Another 50,000 Miles or More from Your Car With a WIZARD-IZED ENGINE That Pays for Itself!

Thousands have discovered this easy new way to end costly repair bills—simply by replacing their old engines with low-cost Western Auto Wizard-ized Engines . . .

No other engine—no overhaul job—can give you more power-packed miles at so little cost! And, you get . . .

The same engine guarantee that comes with a new car—plus a free 500-mile service inspection of our installation. Every Wizard-ized Engine gets a . . .

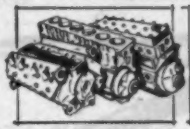
Complete factory inspection and then a final test run. Our installations made by trained mechanics in fully equipped garages. And, this new car power is yours for . . .

Half the cost of a new engine. You're paying for it in gas, oil, repairs . . . why not enjoy it now? For . . .

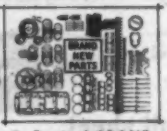
Less than ⅓¢ per mile, you get years of new miles without paying the high cost of a new car. Don't wait . . .

See your Western Auto man tomorrow . . . find out about his guaranteed trade-in allowance for your old engine!

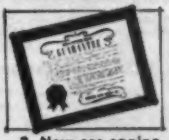
Why You Can Have Confidence In a WIZARD-IZED ENGINE!



1. Not just "rebuilt," but completely remanufactured—using selected original factory block.



2. Typical BRAND NEW top quality parts in Wizard-ized Engines. All other parts fully remanufactured.



3. New car engine guarantee . . . by America's largest group of auto supply stores (over 3000).

4. Backed by a fifty million dollar firm with 25 million customers, proof of dependability!

EASY TERMS AS LOW AS $3.00 weekly
Terms vary by area and make of car

Wizard-ized Engines

FACTORY REMANUFACTURED*

Sold Only By WESTERN AUTO STORES & ASSOCIATE STORES

***The Engine You Can Buy with New Car Confidence!**

NOTE: Western Auto
* Associate dealers own their own stores and set their own prices. Terms and conditions quoted are recommended, and subject to revisions. © 1951, Western Auto Supply Co., K. C., Mo. (S-101)

Refinish

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IT'S FAST! IT'S CLEAN! Sold at leading paint, hardware and department stores.

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Buy the Best...WISS!

for all sheet metal cutting

WISS Metal Master Compound Action Snips

#M-3. Easily cuts 18 gauge sheet metal. Cuts curves and circles as well as straight. Ideal for the home workshop. $4.25. Rubber grips recommended, 60¢ extra.

WISS Straight Cut Snips

#9. Crucible steel inlaid blades. The basic snips for straight metal cutting. Gun metal handles. Overall length 12½". $5.25.

WISS Combination Snips

#V-13. Solid steel, with gray japanned handles. Cuts curves and irregular shapes with ease. Handy pocket size. 7" long. Accurately tempered jaws and strong bolts. $1.85.

J. WISS & SONS CO. • NEWARK 7, N. J.

How to Photograph Your Boss

[Continued from page 262]

original position. Anyway, who wants to make portraits that arouse a "What marvelous lighting!" Better the comment: "That's the man, exactly."

With a small camera and a fast lens, you might use the natural light from a window if it looks well on your subject. If the shadows are too dark you can take a tip from the candid cameramen, who often "cheat" a little by adding a little fill light to the shadows with a photoflood bulb heavily diffused. If the available daylight is too dim or from the wrong direction, it will have to be mazda or flash. I advise placing one light to the side next to the decoy. This will throw a shadow on the camera side of your subject's face. A smaller bulb, diffused with tissue paper next to the camera and close—very close—to the lens, will serve as a fill light, preventing the shadow side of the face from coming out too dark.

Flash Has Advantages

With flash you won't burn up your boss's eyes as you will with mazda, and flash will mean that he won't have to hold still, and you can catch fleeting action and expressions. But with a flash rig fixed to your camera you're sunk—despite the fact that many cameras come this way and most flash outfits are made to clamp onto the camera. Lighting from close to the lens will make your boss's face about as interesting as a newly ironed bedsheet. Get the light off the camera for roundness and texture.

Once you've got the setup right, you can stop acting like a technician. Now you become a picture reporter, a creator, the man with the finger sensitized to react in a split second whenever that beguiling, contemplative, challenging, amused, wonderful expression flits across the boss's face. Click, and you, the recorder, have set down a facet of a man. And that is not such a small thing to have accomplished. END

Radio Waves and X Rays Are Close Kin

RADIO waves and X rays are different forms of electromagnetic radiation. The difference lies only in the length of their waves and frequency of vibration. Of highest frequency and shortest wave length are the cosmic rays that bombard the earth from outer space. These may vibrate as fast as 1,000,000,000,000,000,000,000,000 times a second.

DU PONT URGES TWO STEPS NOW

. . . BEFORE COLD WEATHER CAN CRIPPLE YOUR CAR

1st get your cooling system checked and serviced

Cooling System Specialists

When the cooling system quits, your car quits. If your cooling system is clogged with rust and scale, your engine will overheat. If your cooling system isn't tight, you'll lose anti-freeze mixture and risk a freeze-up. So before you put in any anti-freeze, no matter whose, have your cooling system thoroughly gone over. It is well worth the little it costs.

Go to an expert. The dealer who displays this emblem offers you a *special* winter service. Make a date with him early for anti-freeze and for a thorough cooling system check-up before the anti-freeze rush jams his driveway.

2nd get a Du Pont Anti-freeze

"ZERONE"
(TYPE E)

There's no evaporation problem with Du Pont "Zerone"*—it's trouble-free, needs only an occasional check-up. Use it if you drive at normal altitudes, if your car has a standard thermostat (4 out of 5 cars do), and if you protect to temperatures no colder than thirty degrees below zero.

$1.50 A GALLON

O. P. S. RETAIL CEILING PRICE

"ZEREX"
(TYPE P)

"Zerex"* is made by Du Pont to meet these special driving conditions: *High-opening thermostats*—adjusted to run at 160 degrees F., or higher, *high-altitude driving*, and *extreme low temperatures*. If your driving requires a "permanent"-type anti-freeze, you can't do better than "Zerex."

$3.75 A GALLON

O. P. S. RETAIL CEILING PRICE

*REG. U. S. PAT. OFF.

DU PONT
REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

Plane Trails Are Ice

THE long white smoky trails sometimes seen behind airplanes flying at high altitudes are made of ice crystals. They are formed when moisture-saturated air compressed by the leading edge of the wing moves to the back of the wing and expands, causing a rapid cooling that freezes the water vapor to ice. The effect is especially pronounced behind high-speed jets.

Removing Rust Stains from Enamel

LIGHT rust stains may be removed from an enameled sink or refrigerator by applying lemon juice or vinegar to the spot. Let it stand a few minutes and then wash away with water. Heavier stains may need a diluted solution of hydrochloric acid. As this is corrosive, apply with cotton at the end of a stick, and avoid touching unenameled metallic parts.

Musical Note Controls Gyro

A SINGLE musical note, traveling almost 1,000 miles, is being used to regulate the speed of sensitive gyroscopes. The note, A above middle C, with a vibration of exactly 400 cycles per second, is broadcast by the National Bureau of Standards' short-wave station WWV near Washington, D.C. It is then picked up by Minneapolis-Honeywell engineers in Minneapolis, where it checks a tiny electronic fork attached to a gyroscope.

Sanding with a Cotter Pin

NEED a small drum sander for smoothing holes fast? A medium-sized cotter pin and a little strip of abrasive paper will make one. Slip one end of the paper between the legs of the pin and wrap it around clockwise, as seen from the eye end of the pin. Cement the outer end down. Chuck the shank of the pin in a hand grinder.

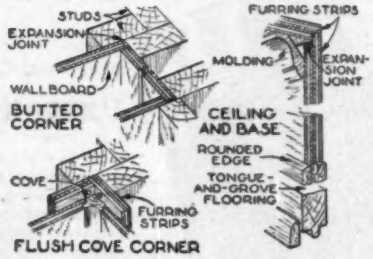
When Is Next Eclipse of Sun?

THE next total eclipse of the sun visible in the United States will occur on June 30, 1954. It will be seen along a 100-mile-wide strip, starting in Nebraska and moving in a northeasterly direction over South Dakota, Minnesota, Wisconsin and Canada.

Sunshine Discolors Antique Glass

CLEAR antique glass will frequently turn purplish after long exposure to the sun. This is a result of chemical action caused by the ultraviolet rays in the sun's light that changes the manganese oxide in the glass to the permanganate form, which is purple in color. Modern glass, using other chemicals, is not so affected.

PLYWOOD CORNERS



When plywood used for interior walls is nailed directly to studs, allowance should be made for movement at the corners. Most simple is the butting of one edge against the face of the adjacent sheet. Expansion space is left at the edge of the sheet butted against. Unless corner studs are unusually straight, the butting edge will have to be scribed to make a close joint.

In better installations where furring strips are nailed to the studs and the plywood is glued, corners can be made solid with glued rabbets, cove strips, and the like. If the cove strips have rabbeted edges to match rabbeted edges of the plywood sheets, they can be nailed in to hold the plywood edges while the glue is drying; thus rabbeted cove and plywood surfaces are made flush more easily than plain-edged coves butted against square-edged plywood.

The same kind of corner can be used at the ceiling, or the joint may be an open butt covered with a cove molding or a more elaborate cornice.

If the plywood is carried to the floor, it will be subject to scuffing unless protected by a baseboard. A matched flooring board nailed with the groove up to receive the plywood is easily installed.

FOR YOUR POPULAR SCIENCE INFORMATION FILE

Which lamp is ready to burn out?

ONE of the General Electric "All-Glass" headlamps on the test car above has just been lighted for the first time. It's at the beginning of its life. The other G-E lamp... the one on the left . . . has been burning day and night for many, many months. Yet when the photo was taken it was impossible to see any difference in the light output of these 2 lamps!

That's because General Electric "All-Glass" headlamps give an average of 99% as much light just before burning out as when new. Both the lens and reflector of the G-E headlamp are made of hard glass, fused together into one piece. Road and laboratory tests prove that this one-piece unit keeps out the dirt and moisture that might otherwise gradually rob the lamp of light output.

Because they DO NOT GROW DIM, G-E "All-Glass" headlamps mean easier, SAFER night driving. Use them to replace burnouts whenever you need a replacement.

G-E "All-Glass" Headlamps DO NOT GROW DIM!

You can put your confidence in—

GENERAL ELECTRIC

BIG MONEY

USING AMAZING

NEW, SAFE

JIG SAW

AT HOME!

ONLY $22.95 MOTOR INCLUDED

MOST POWERFUL SAW OF ITS KIND!

Arm adjustable for cutting any length material!

CUTS 1" WOOD, THIN METAL, PLASTIC! QUIET!

Ready — America's most amazing jig saw for home fun or profit! Largest, most powerful saw of its kind! QUIET, ideal for apartments! SAFE . . . blade does NOT pull fingers toward it. No belts, gears or oiling! Adjustable "any length cut" arm. With BUILT-IN New Reactance Type Electric Motor, $22.95 at dealers or postpaid.

SYNCRO POWER UNITS GUARANTEED AGAINST BURN-OUT DURING YOUR OWNERSHIP OR REPLACED FREE!

The Name You Can Trust

SYNCRO QUALITY TOOLS

ELECTRIC JIG SAW

U.S.A. Model No. 201. 60 Cycle, 110-120 Volt AC. Other Voltages, Cycles available. Dealers, Jobbers — Write!

USE COUPON FOR CIRCULAR OR DIRECT ORDER

SYNCRO CORP., DEPT. G-101, OXFORD, MICHIGAN, U.S.A.

☐ ORDER. I enclose $22.95. Send No. 201 Saw postpaid on 10 Day Money Back Guarantee.

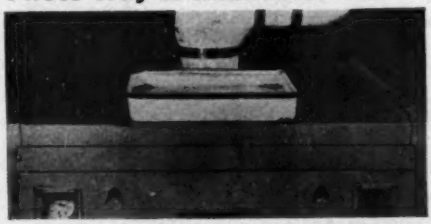
☐ FREE CIRCULAR. Send new SYNCRO CIRCULAR showing new SAW and NEW SANDER.

WRITE NAME, ADDRESS BELOW — MAIL TODAY!

Cart Made from Baby Carriage

I DON'T strain my back moving ash barrels and other heavy objects any more, thanks to this utility cart. To make it, I simply removed the body and springs from a discarded baby carriage, and then sawed off half the frame that joined the front and rear axles. I find the cart particularly handy for easing barrels up and down stairs.—*J. J. Stefanowski, Bayonne, N. J.*

Photo Tray Is Humidifier Pan



ENAMELED photographic trays that are too chipped to be used in the darkroom any longer make fine humidifiers for the furnace. —*R. Hertzberg, Jackson Heights, N. Y.*

Hinges from Adhesive Bandages

I SAVE the stiffened gauze or crinoline from adhesive bandages and use it for repairing book bindings or for hinges on projects made from cardboard or other light material. After a hinge is applied with glue, it can be covered with a strip of paper.—*Frank Shore, New York City.*

GROBAN'S WAR SURPLUS SPECIALS

ALL BRAND NEW — FULLY GUARANTEED

D.C. GENERATORS

For welders, plating, truck and marine use, D. C. appliances, lights, etc. Aircraft quality—lifetime grease sealed ball bearings. Heavy duty.

Item #131—Brand new Electric Auto-Lite 12 volt Direct Current electric generators, rated 18 amps. Complete with blower and pulley. Use for trucks, tractors, boats, battery chargers, etc. Part No. GEF-4805A. In original sealed U. S. Army cartons. $40.00 value. Shpg. wt. 27 lbs. F.O.B. Chicago. Now Only **15.00**

Item #90—Type P-1, rated 200 Amps.—28 Volts. 2500 RPM. Mfd. by General Electric, Ford, Delco-Remy and Westinghouse. Gov't. Acq. Cost $300.00. Shpg. wt. 53 lbs. F.O.B. Chicago **22.50**

Item #91—Type R-1, rated 300 Amps.—30 Volts. Mfd. by Jack & Heintz. Gov't. Acq. Cost $380.00. Shpg. wt. 59 lbs. F.O.B. Chicago. Each individually packed in wooden box **35.00**

Vickers HYDRAULIC PUMP

(Item #39)

Piston Type Ideal for use with hydraulic cylinders and valves described in this page ad. Vickers constant displacement piston type pump delivers .507 cubic inches per revolution. 8 gallons per minute at 3750 RPM. 1000 PSI. Has ¾" diam. shaft ¾". 18 thread inlet and outlet ports. Rotation—clockwise. Fpd. **19.90**

Item #132 BYRON-JACKSON "PUP" CENTRIFUGAL PUMP UNIT

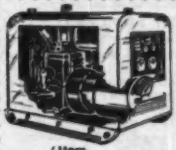
2 Stage Model "PUP" Pump Driven By An 8 Cylinder Model C-36 Chrysler Industrial Engine. Gov't Acquisition Cost $3800

ENGINE SPEED 2400 RPM—100 H.P.
600 GPM AT 175 PSI—PARALLEL CONNECTION
300 GPM AT 375 PSI—SERIES CONNECTION

Ideal For: • PIPE LINE SERVICE • IRRIGATION • PICK-UP • SALT WATER DISPOSAL • GATHERING • FIRE FIGHTING • SPRINKLERS • CONSTRUCTION

These skid-mounted Pumping Units are standard production models with parts and service readily available. Designed for a wide range of operating conditions particularly where wide variation in head and capacity are required. Twin suction and discharge ports are cast on the same side and so arranged that external piping is interchangeable for either parallel or series pumping applications. Overall dimensions, 114" L x 29" W x 62" H. Weight 2480 lbs. Now, complete with operating instructions and performance data. F.O.B. Chicago **1495.00**

A. C. GENERATING PLANTS



(Item #133)

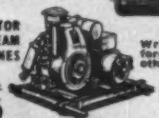
IMMEDIATE DELIVERY—LARGE STOCK—MANY SIZES

Item #133—3 KW—120 Volts—60 Cycle A.C. Single Phase HEAVY DUTY

DESIGNED FOR CONTINUOUS OR INTERMITTENT SERVICE

PLENTY OF CURRENT TO OPERATE YOUR— • OIL BURNER • REFRIGERATOR • HOME FREEZER • SUMP PUMP • POWER SAW • BROODER • CREAM SEPARATOR • INCUBATOR • VENTILATING FANS • MILKING MACHINES • BLOWERS • YARD LIGHTING • OTHER APPLIANCES

(Item #86)



(Item #98)

Write for information on other size generating plants ranging from 350 watts to 25 KW.

Totally enclosed power unit with 2 cylinder water-cooled Hercules Model BXB engine direct coupled to generator. Magneto ignition, crank start, 4 gallon gas tank, 5 qt. oil capacity. Skid mounted with handrails for carrying. Instrument panel including killer button, oil pressure, water temp. gauges, voltmeter, ammeter. Shipping wt. 560 lbs. F.O.B. Chicago ..... Item #133 **395.00**

GENERAL MOTORS — ALLISON CENTRIFUGAL PUMP

BRAND NEW

(Item #130)

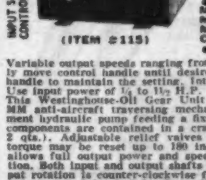
200 GALLONS PER MINUTE

• For Draining Basements • Fire-Fighting • Irrigation • Fuel Transfer • Swimming Pools • Home Water Systems • Dewatering

This General Motors-Allison Centrifugal Pump—designed for use on U. S. Air Force Mustang fighters, now converted for commercial, home, and industrial high volume pumping applications. Inlet, 2½" standard pipe thread, twin outlets with 1½" pipe thread, ball bearing supported ¾" shaft. Easy, fast simple priming. Rotation, counter-clockwise facing shaft. Shipping wt. 35 lbs. Gov't acq. cost $145.00. Now Only **39.50** F.O.B. Chgo.

Suction Lift	Head Pressure	Gal. Per Min.	H.P.	R.P.M.
10'	75'	260	6.0	3500
10'	60'	200	5.2	3500
10'	80'	40	1.5	2500
10'	50'	140	5.0	3500
10'	30'	100	3.0	2500

HYDRAULIC SPEED REDUCER with FINGERTIP CONTROL



(ITEM #115)

• USE FOR: • Reamer Drives • Midget Cars • Feed Mills • Canning Machines • Conveyors • Lathes • Milling Machines • Motor Boats • Cream Separators • Garden Tractors • Pumps

Variable output speeds ranging from 0 to input speed now available. Merely move control handle until desired speed is attained. Then turn locking handle to maintain the setting. Internal relief valves prevent overloading. Use input power of ½ to 1½ H.P.

This Westinghouse-Oil Gear Unit converted to commercial use from 40 MM anti-aircraft traversing mechanisms consists of a variable displacement hydraulic pump feeding a fixed displacement hydraulic motor. These components are contained in a crackle-finish steel oil reservoir (capacity 2 qts.). Adjustable relief valves set at factory for 100 inch pounds of torque may be reset up to 180 inch pounds. Independent reverse control allows full output power and speed selection in either direction of rotation. Both input and output shafts measure ⅝" diam., include keyway. Input rotation is counter-clockwise facing shaft. Recommended input speeds not to exceed 750 R.P.M. Over-all dimensions 7½"x7½"x11½". Gov't acquisition cost, $425.00. Shipping weight 31 lbs. Complete with 2 qts. of oil and full instructions. F.O.B. Chicago **54.50**

Hydraulic Cylinders-Air or Oil

Large supply of new labor-saving, economical hydraulic equipment in many types and sizes. Use these positive, highly efficient smooth pressure hydraulics on presses, arbors, lifts, loaders, power control, positioning, brakes, plastic dies, auto frame alignment, etc., etc.

ITEM #70—Purolator hydraulic oil filter. Permanent element type. ¾" female pipe thread ports. Capacity 16 gallons per minute. A $13.00 value, now **postpaid** **4.95**

ITEM #4—All steel double action hydraulic cylinder. 1½" bore, 2½" stroke, Clevis mounting. Will lift 1000 lbs. with 1000 P.S.I. line pressure. Perfect for positioning and feeding movements. Shpg. wt. 4 lbs. **Postpaid** **4.95**

ITEM #127—Double acting hydraulic cylinder. 1" bore, 1" stroke, ½" diam. shaft, ½" tubing thread ports. Over-all length closed—6½". Clevis mounting at both ends. Perfect for clamping and feeding. **Postpaid** **5.95**

ITEM #33C—Double action hydraulic cylinder, 1½" bore, 4½" stroke, Clevis mountings at both ends. Uses ¼" pipe fittings. **Postpaid** **8.95**

ITEM #16C—Double acting hydraulic cylinder, 1½" bore, 26" stroke. Will lift 1760 lbs. with 1000 PSI line pressure. Weight 8 lbs. A $55.00 value. Now Only. **Postpaid** **16.95**

(Item #42)

ITEM #103—Double acting hydraulic cylinder, 2½" bore, 17" stroke, Clevis mounting. Will lift 4900 lbs. with 1000 PSI line pressure. 1¼" diam. shaft, ⅝" tubing thread ports. Over all length closed 28". Shpg. wt. 11 lbs. F.O.B. Chicago **21.50**

ITEM #31C—Double acting hydraulic cylinder, 2½" bore, 11" stroke. Aluminum alloy cylinder wall and all steel 1¼" piston rod. Clevis mounting at both end and shaft. 19½" over-all length closed. Will lift 9625 lbs. to 1000 PSI from Logan Heavy Duty Hydraulic Pump. Uses ⅝" tubing fittings. Value $1152.00. Shipping wt. 11 lbs. F.O.B. Chicago **22.50**

ITEM #6—Double action hydraulic cylinder, 3" bore, 24" stroke, will lift 7070 lbs. with 1000 PSI line pressure. Steel barrel, 1¼" stainless steel shaft. Gov't acq. cost $176.00. Ship. wt. 30 lbs. F.O.B. Chicago **28.00**

ITEM #42—Double action hydraulic cylinder, 4" bore, 18" stroke. Rated lift capacity with 1000 PSI line pressure is 12,500 lbs. Ship wt. 30 lbs. F.O.B. Chicago. An Excellent Buy for **32.50**

HYDRAULIC CONTROL VALVE

(Item #126)

Newly Manufactured to Our Specifications

Four-way, open center control valve with built-in adjustable relief valve. Factory set at 1000 PSI., spring-loaded neutra position, for use with one double-acting cylinder. Fully balanced plunger type, smooth, easy operation, can be used as single unit or mounted in series of any combinations desired. Has ¾" pipe thread inlet and outlet, ½" pipe thread cylinder ports. Shipping weight 8½ lbs. An outstanding Buy! F.O.B. Chicago **21.50**

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POINTERS FOR HOME PAINTERS

How to get better paint jobs ... make your brushes last longer

When you're painting overhead, dip brush to only one inch. Raise the brush quickly. Start in corners of ceilings. Use short, light strokes.

On rough surfaces, brush first coat in well to cover all cavities, prevent entrance of moisture. Brush second coat with smooth, even strokes.

For overnight cleaning, pour on a little thinner, work out paint on newspaper, using stick or paint scraper to squeeze out paint, suspend brush in thinner.

When you **store** brushes for longer periods, clean thoroughly and wrap securely in manner shown here. Brushes stay in better condition when they're kept in shape.

For best results use NYLON PAINT BRUSHES

Job after job, you'll get best results with a well-tipped nylon paint brush. Durable Du Pont nylon bristles don't break off, even on roughest surfaces. They last 3 to 5 times longer than ordinary bristles . . . paint smoother . . . are clean and sanitary. Nylon paint brushes are made by leading manufacturers in all types and sizes. Look for the word NYLON on the handle.

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Better Things for Better Living
. . . through Chemistry

The best brushes have
DU PONT NYLON
BRISTLES

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- "Refinishing Antiques"
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Here are 101 useful ways to use America's finest 100% pure linseed oil. Perfect for painting and the handiest item for every housewife, homeowner and farmer. Available at all stores.

EARN $2.00 EASY

We will pay $2.00 for each new practical idea for using Pol-mer-ik Linseed Oil, which is acceptable to our research laboratory. Write Archer Daniels Midland, 604 Roanoke Bldg., Minneapolis, Minnesota.

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LOCKS on the work, "HOLDS ON" after you let go."

Finest locking plier because...

Clamps on better with *patented swivel jaw* which adapts itself to shape being held. Faster working because of *patented jaw size indicator;* you pre-set jaw size to approximate size of object. Easier opening with *patented lock release;* finger-operated lever readily releases 2000 pound bite.

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7" size
10"—$2.50
Both bright nickel finish

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SEYMOUR SMITH & SON, INC.
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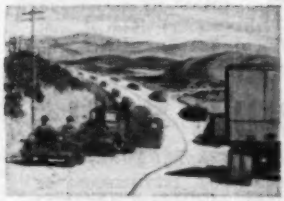
100 years of quality tools

Here's Solid Evidence That

CHAMPION

SPARK PLUGS

Are Better For Your Car



Never before has America's need for dependable transportation been so great—in both military and civilian service. And never before have Champion Spark Plugs been in such great demand because of their reputation for economy, power and long life.

Quality products are always first choice—and Champions have been America's favorite for over 25 consecutive years!

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Listen to the CHAMPION ROLL CALL . . . Harry Wismer's fast sportscast every Friday night, over the ABC network

FREE PLAN

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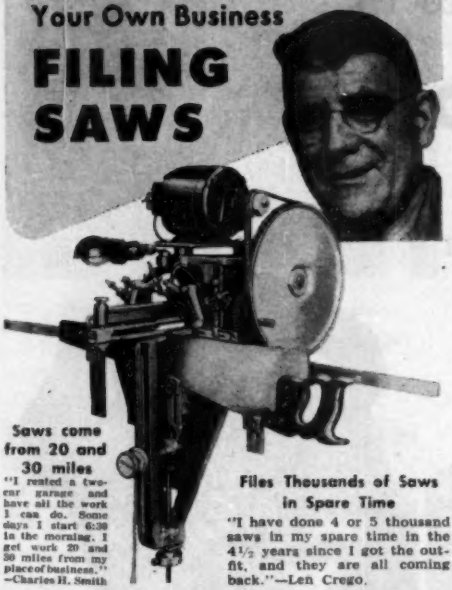
FILING SAWS



Saws come from 20 and 30 miles

"I rented a two-car garage and have all the work I can do. Some days I start 6:30 in the morning. I get work 20 and 30 miles from my place of business."—Charles H. Smith

Files Thousands of Saws in Spare Time

"I have done 4 or 5 thousand saws in my spare time in the 4½ years since I got the outfit, and they are all coming back."—Len Crego.

FOLEY FILED SAWS BRING NEW CUSTOMERS

Here is a steady repeat CASH business you can start in your own basement or garage in your spare time. Every saw you sharpen with the machine accuracy of the Foley Saw Filer is an ad that brings more customers. S. M. Hollingshead wrote to us: "I am doing very well with my Foley Filer, and I am glad I invested in your machinery. It is very satisfactory and works very well in the small community in which I live."

You can file all hand saws, also band and crosscut circular saws on the Foley Saw Filer. The adjustments are simple—there is no eyestrain—and you can start right away to turn out perfect cutting saws. "The first saw I sharpened with my Foley Saw Filer came out 100%. I think it is a marvel of perfection."—writes Clarence E. Parsons.

"INDEPENDENCE AFTER 40!" explains how you can get business from hardware stores, home owners, farmers, carpenters, schools, mills, factories, etc. Just think—with a modest investment, no overhead, no stock of goods to carry, you can start right in on a cash business that will help pay the rent, buy groceries, or a new car. Get the facts—send coupon today for this practical, money-making plan. No salesman will call.

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Send me free book **"INDEPENDENCE AFTER 40!"**

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IT'S easy and inexpensive to build an extra bedroom, bathroom, game room, photography darkroom or what-have-you with Gold Bond Gypsum Wallboard. Just nail the sturdy, fireproof panels right to lumber framework or over an old wall or ceiling. Joints can be completely concealed with Gold Bond Perforated Tape Joint System. Decorate with Gold Bond Sunflex—the one-hour wall paint, or with Gold Bond Color Texture, which goes on like paint and covers the wall like plaster. Choice of 8 brand new colors.

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ALUMINUM NAILS

OFFER ALL THESE FEATURES

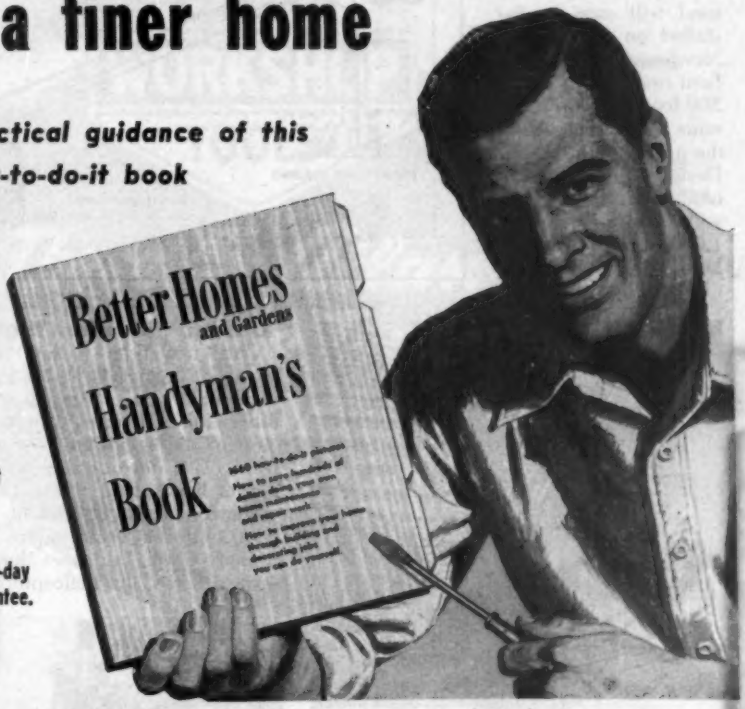
- WILL NEVER RUST-STREAK OR STAIN SIDING AND SHINGLES
- ECONOMICAL TO USE—COST VERY LITTLE MORE THAN ORDINARY NAILS
- NO COUNTERSINKING OR PUTTYING NECESSARY
- EASY TO DRIVE—ETCHED FOR SUPERIOR CLEANLINESS AND HOLDING POWER

Look around your neighborhood and you'll see how ordinary nails have marred the beauty of painted siding. Never-Stain Aluminum Nails will not rust to cause unsightly streaks or stains. Billions now in use.

NICHOLS WIRE & ALUMINUM CO.
Davenport, Iowa

Save HUNDREDS of dollars and enjoy a finer home

with the practical guidance of this big new how-to-do-it book



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Why pay out your good money on sky-high repair bills? You can handle those jobs as well or better yourself, with the expert know-how in this big new Handyman's Book. 14 full sections show how to:

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The A to Z of repairing and improving your home:

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Reduce fuel costs
Service oil or gas
Clean chimneys, etc.

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Open clogged drains
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Fix leaky faucets, etc.

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Refinish floors
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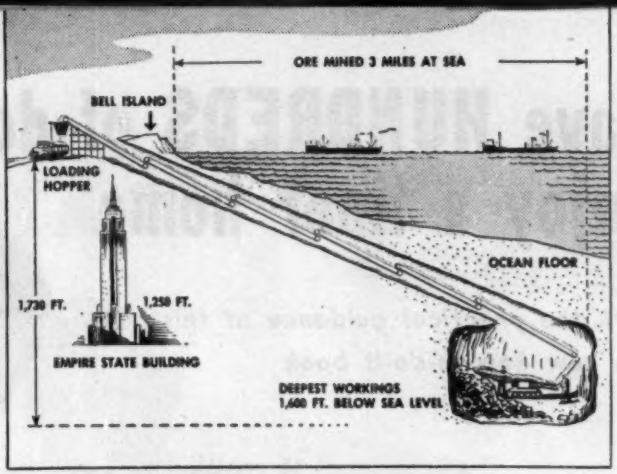
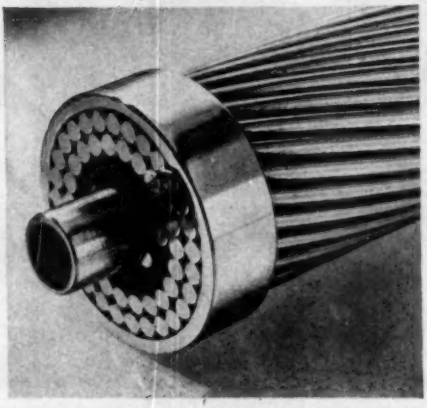
2½-Mile Belt to Haul Sea Ore

THE longest and highest slope conveyor ever used will soon be installed on Bell Island, Newfoundland. It will haul iron ore up a 12,500-foot shaft from a mine 1,600 feet below the surface of the ocean. Designed by Goodyear of Canada, the 36-inch-wide belt will deliver 1,000 tons of ore an hour.





Wire Carries 330,000 Volts

THE world's largest electric cable for overhead transmission will be installed in West Virginia to carry 330,000 volts, highest ever used in America. Since current travels mostly on the surface of a conductor, the 1.6-inch wire is needed to handle the super-voltage. A 4,500-foot reel of the steel-and-aluminum wire, made by Alcoa, weighs five tons.

'Bubble' Shields Wounded

THIS new litter (below) for evacuating wounded troops by helicopter replaces the old "coffin-type" carrier in which wounded often suffered from claustrophobia. The clear-plastic hood protects a soldier from wind blast and exposure without confining him or limiting his vision. The nylon-fabric cover for the lower part of the body has pilot-controlled heater ducts. Made by Bell Aircraft Corp., the sheet-aluminum litter is easily attached to a helicopter's landing gear.

Maple Syrup Flavor Tracked Down

THAT delicate flavor and characteristic color of maple syrup is not present in the sap taken from the tree. The qualities are developed by the action of heat during boiling. Scientists at the N. Y. State Agricultural Experiment Station have proved this by preparing a batch of syrup by a new freezing method. It turned out gray in color and unlike normal syrup in taste.

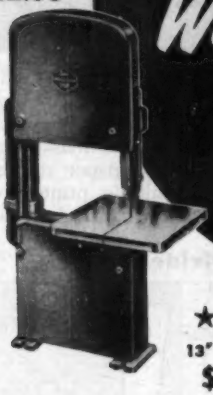
LOOK!

Atlas WORKSHOP TOOLS

★NEW 8" BENCH SAW $33.95

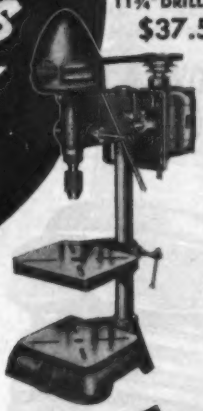
★NEW 4" JOINTER $28.75

★NEW 10" BAND SAW $42.50



These 5 Atlas Workshop Tools FOR ONLY $161.20

★NEW 11¾" DRILL PRESS $37.50



★NEW 13" JIG SAW $18.50

ALL PRICES LESS MOTOR
F.O.B. KALAMAZOO, MICH.

— AND ALL CAN BE OPERATED FROM 1 MOTOR

★ Look at the tools . . . *look at the prices!* If you're one of those men who have long wanted a home shop equipped with fine precision tools, but haven't wanted to spend the money for large, expensive machines — these Atlas Workshop Tools will suit you to perfection. Each one is backed by 40 years of Atlas precision-engineering. They give your shop *greater* versatility at *less cost* than any tools or combination tool you can buy! — *and all 5 can be powered with 1 motor!* You'll want to see them at your first opportunity. Ask any Atlas or Atlas-Power King dealer for full details. Send the coupon for complete catalog.

SEND FOR FREE CATALOG

ATLAS PRESS CO.
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Please rush your Workshop Tool catalog.

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DEPENDABLE QUALITY TOOLS

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INSIST ON
BOWES
SEAL FAST
DEPENDABLE
SPARK PLUGS
Here's Why—

★ Every Bowes Plug is Individually Tested—tested at higher voltage than is ever encountered in your car.

★ Oversize Special Alloy Electrode . . . welded construction assures positive connection.

★ Extra Large Ground Electrode assures longer life for plug.

★ Husky Aluminum Oxide Type Insulator assures against porosity—sure proof against shorting.

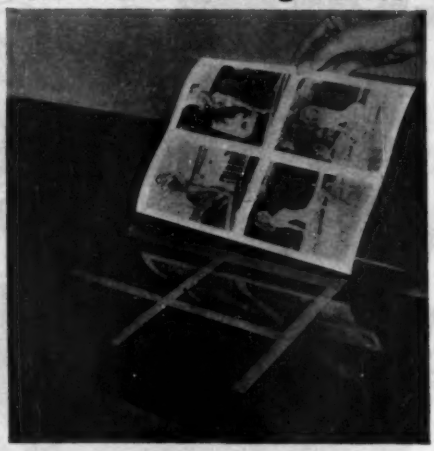
★ One-Piece, Leak-Proof Construction.

★ Patented Engine Gasket Retainer Ring assures better contact and better heat transfer.

BOWES PLUGS
are tailored to YOUR car's motor
If your favorite SERVICE STATION does not handle Bowes Spark Plugs, write us direct for further information.

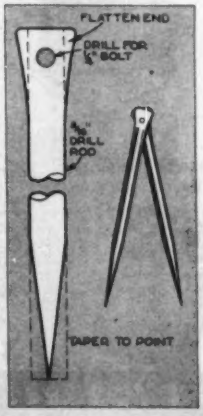
BOWES "SEAL FAST" CORPORATION
INDIANAPOLIS 7, INDIANA

Four Photos on a Single Sheet



You can make four prints nearly 4" by 5" in size on a single 8" by 10" paper by taping the contact-printer glass this way. A L-shaped piece of black paper masks out the unused portion of the paper during each exposure. Such multiple prints are good for an album.—*V. Hanson, Los Angeles.*

How to Make Dividers



My favorite dividers are a pair I made from 3/16" drill rod. First I heated two pieces to a cherry red at one end and flattened the heated ends for about 1¼" to a thickness of 1/16". Then I ground long tapers and sharp points on the other ends.

The flattened ends were drilled for a ¼" bolt, which was held with a washer and nut. The pointed ends were next heated to redness and quenched in water. After polishing, they were reheated to a straw color. The nut adjusts joints.—*George Berkwitt, New York City.*

Old Brush Handles Fit Files

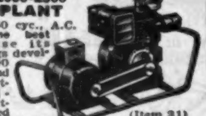
Salvage the handles of vegetable-scrubbing brushes discarded by your wife. You'll find they make excellent handles on small files.—*P. Stillwell, Anaheim, Calif.*

BUY DIRECT - MASTER MECHANIC - UP TO 85% DISC.

Portable LIGHT PLANT

PUSH BUTTON START
500-700 watts 110-120 v. — 60 cyc. A.C. Powered by a sturdy dependable, easy starting, air cooled 1¾ hp. gas engine. No wiring necessary, just plug in and operate. Plenty of current for any oil burner, freezer, brooder, pump, emergency lights, (Item 24) etc. which require up to 700 watts. Ideal for Civil Defense, Fire Depts; trailers & camps. Complete with Voltmeter and built-in winding to charge 6 v. auto batteries, Wt. 85 lbs. Fully guaranteed. **Be prepared if war or storm knocks out power lines.**
Reg. $275.00 value............ **$143.50**
700-800 Watt Plant (Item 44) same as Item 24, but greater output... **$169.95**
1000-1200 Watt Plant (Item 45) same as Item 24, but larger generator & engine............. **$199.50**

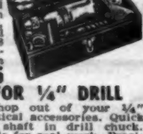
GIANT 2000-2500 WATT PLANT



(Item 31)

110-120 V. 60 cyc., A.C. **Absolutely the best made** because its heavy windings develop up to 5000 watt overload for motor starting. Skid-mounted—portable. Powered by 5 h. p. easy starting Briggs or Wisconsin engine—complete with all accessories; engine easily disconnected for other uses. Big outlet box, voltmeter, no wiring necessary. Ample current for all purposes. Factory warranty and instructions included. Wt. 220 lbs. Reg. $585.00, Special at.... **$299.50**
GENERATOR ONLY and control box. Drive it with your engine or tractor **$169.50**

38 Pc. DRILL KIT



(Item 35) Includes hi-power smooth-running guar. ¼" drill, buffers, polishing bonnet, sanding discs, grinding wheels, wood bits, steel bits, wire wheels, bench stand, paint mixer, burrs. Complete in steel case. Wt. 13 lbs. 38 pc's., all highest quality. Complete kit worth $38.50. Our Spec. only... **$19.85**

ACCESSORIES FOR ¼" DRILL

Make complete workshop out of your ¼" drill, using these practical accessories. Quick change—merely insert shaft in drill chuck. Sturdy, heavy duty tools for real work. Precision built of hardened tool steel. Factory guaranteed against breakage.

POWER HACK or JIG SAW

(Item 64) makes straight or curved cuts easily in plywood, ¾" boards, sheet metal, plastics, etc. Uses broken hack saw blades. Will do filing, jig saw, coping saw and sabre saw work. Compares with $50 tools. Wt. 3 lbs. Special... **$16.95**

ELECTRIC HAND SAW

(Item 66)

(Item 66) The famous Arco-Saw converts any ¼" or ⅜" drill into a powerful electric saw. Exclusive features—one hand operation, visual guide bevel and angle adjustments, rip gauge depth gauge. Self lubricated for life. Wt. 3 lbs. Complete with 4" blade....... **$11.50**

Power Sander & Polisher

(Item 65) Make quick work of slow tedious sanding jobs. Big 21 sq. in. sanding surface. Produces powerful lengthwise sanding stroke which results in beautiful smooth finish. Built-in rubber pad. Sandpaper held in place by quick-change spring-clips. No messy adhesives. Use felt pad for polishing. Using drill motor for power gives you equivalent of an $85 sanding machine. Wt. 3 lbs. Terrific value at... **$16.50**

FIRE EXTINGUISHER

(Item 39) Fully charged (at 1,000 lbs. P. S. I. or more) with CO2 (carbon dioxide), the proven miracle fire fighting chemical that smothers oil, gasoline and electrical fires. Play safe; keep one in your car, garage and home. Heavy ICC approved steel cylinder, valve and 3000 lb. gauge that shows available remaining pressure. REFILLABLE at nominal cost. Hose included for emergency tire inflator or air blast. Wt. 4 lbs. $19.50 value. Special................ **$6.95**

LARGE FIRE EXTINGUISHER (Item 57) commercial size, 5 x 14 in. (275 cu. in.) heavy ICC approved steel cylinder charged at 1000 lbs. or more with CO2. Equipped with genuine Kidde Valve. Refillable. Hose incl. Suitable for fire depts., stores, garages, homes, etc. Wt. 18 lbs. $42.50 value. Spec.. **$15.85**

HEAVY DUTY ARC WELDER

(Item 38) Use as portable or shop welder, 250 amps, D.C., Senior model. Made for years of trouble-free, continuous service. Will handle light or heavy jobs. Weld up to ⅛" plate using ⅛" rods. Built-in air-cooling system. Arc is easy to strike and hold, because of specially designed arc stabilizer. Hi-lo switch and dial control gives wide range of welding heats. Run welder at 2600 rpm. with tractor, jeep or 10 hp. gas engine, or 7 hp. elec. motor. Complete with instructions, guar. and double V belt or flat pulley. Wt. 110 lbs.
A $400 value at.............. **$99.75**
MAGIC TERMINAL model same as above but with built-in 3rd terminal for low heat soldering and brazing. Special.......... $119.50
WELDING KIT. Two 10 ft. leads, welding helmet, electrode holder, ground clamp. Sold only with welder at.... **$10.50**

28 pc. BENCH GRINDER KIT

(Item 71) A rugged precision Grinder powered by ¼ hp AC 110 v. 3500 rpm heavy duty motor. Equipped with tool rests and non-breakable safety eye-shields. 28 pc. kit incl. 2 grinding wheels, wire wheel, drill chuck, arbor, ass't'd drills. 14 sanding and polishing discs, buffs, etc. All highest quality. 1 year guar. Wt. 17 lbs.
Drastically reduced.............. **$21.95**

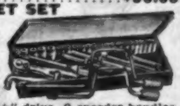
CARRY-AIR

(Item 32) Stainless steel tank—capacity 300 cu. in. at 400 lbs. press. complete with inlet and shutoff valves, press. gauge, detachable air hose, tire chuck. Fill at any service station. Carry air for tire inflation, blowing out lines, spray painting, insecticides, etc. One emergency pays back cost. Wt. 10 lbs.
Worth $20.00. Our price........... **$8.95**
(Item 55) With big double tank (1000 cu. in.).......... **$11.95**

POTTERS WHEEL

(Item 47) Complete, prof. equip. for making finest ceramics and pottery. Large dynamically balanced cast-aluminum reversible turntable with variable speed drive (38 to 140 rpm) controlled by foot-pedal. Built-in adjustable arm rests, water cup and wedging wire. 16x12" enclosed throwing table—ample area for largest pieces. Req. ¼ hp. motor (not incl.). Can be set up on 20x24" table and stored on edge. Complete with pulleys, belts and instructions. Wt. 26 lbs.
$145 value at.............. **$59.95**

32 pc. SOCKET SET



(Item 59) Highest quality guar. non-breakable sockets made by Plomb, Snap On, etc. Complete range of 22 sockets from ¼" thru ¾" in ⅜" drive and 7/16" thru 1-1/16" in ½" drive. 2 speeder handles, 2 extensions, 2 slide heads, double ⅜ x½ in. "L" handle, reversible ratchet, 12" Phillips type screw driver and metal tool box. For professional mechanics who want the best. Wt. 14 lbs. Easily worth $32.50, while they last........... **$15.95**

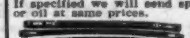
RUBBER HOSE

New genuine Neoprene Hose — outlasts ordinary rubber 3 to 1. Reinforced with super tough cotton cord plies. Flexible. Easy Flo brass couplings with standard pipe threads for quick connections, included. **Pump water for irrigation, stock tanks, home, barn, fire fighting, etc. Pump Gas or Fuel Oil.** Save more than 60%.

(Inside Diam.)	1"	1¼"	1½"	1½"
Length	10 ft.	25 ft.	40 ft.	30 ft.
Price	5.95	9.25	14.75	14.75

If specified we will send special hose for gas or oil at same prices.

HYDRAULIC HOSE



High pressure, heavy duty, complete with swivel fittings. Pipe thread connections. Ideal for farm equip., bulldozers, grease guns, airbrakes, etc. Any length. Minimum $1 per lgth. INSIDE DIAMETER, ¼" 50c per ft. ⅜" 60c, ½" 80c, ⅝" 90c.

EXTENSION CORD

(Item 16) 40 ft. heavy duty, made of specially insulated No. 14 2-conductor wire. So tough that you can drive over it and yet amazingly flexible and easy to handle. Resists oil, grease or water. Extends electricity up to 400 ft. without voltage drop. Use indoors or out. Complete with heavy rubber plug and outlet. Wt. 2½ lbs. Usually $4.50—Special 40 ft. $1.99
Comb: 2-40 ft. and 1-20 ft. (total 100 ft.) $4.95
100 foot length (one piece).......... $4.85
WIRE ONLY (Item 50) No fittings, 100 ft. $4.00
TRENCH-LAY WIRE. (Item 51) Anaconda #10—2 cond., for buried service to barns, outdoor lights, etc. Absolutely impervious to soil and moisture. Wt. 25 lbs. per 100 ft. Special surplus price, 100 ft. coils, 19c per ft.; 250 ft., 18c per ft.; 500 ft., 17c per ft.
POWER CABLE (Item 67) #12—2 cond. stranded, flexible, vinyl covered, impervious to everything. 50 ft. wt. 7 lbs............ $15.95

HEATING & VENTILATING FAN

(Item 10) Easily installed in furnace pipes. Forces even heat to all rooms. Over range, removes kitchen smoke and odors. Powerful continuous duty motor, 110-120 V. A.C. Quiet, super efficient fan moves huge volume of air (400 to 600 c.f.m.) 8" Fan, wt. 5 lb. $6.35; 9" Fan, wt. 6 lbs. $7.49; 10" Fan, wt. 7 lb. $8.45; 12" Fan, wt. 8 lbs. $9.45.

HIGH PRESSURE HAND PUMP

(Item 53) Positive displacement type. Cap. 550 gph. Completely self priming. ¾" pipe thread inlet and outlet. Use for fuel or water transfer on boats, trailers, air craft, etc. Ideal for insecticides, emerg. sump pump or as vacuum pump. Wt. 15 lbs. Govt. cost $95. Our Special.............. **$12.95**

VARIABLE SPEED SELECTOR

(Item 68)

Heavy duty, made by **B. F. GOODRICH** for industrial use. Provides instant speed changes for any drive. For machine tools, dryers, printing, conveyors, production lines, hoists—any operation requiring variable speed. Ideal for midget autos. Employs reliable "trouble free" planetary system. No hydraulic power losses or creeping. Infinite range, smooth operation, easy installation. 3 sizes: ½-1 hp. wt. 36 lbs; 4-2 hp. wt. 55 lbs.; 2-3 hp. wt. 105 lbs. Reg. list $228, $252 and $352. Brand new, in Goodrich boxes and guaranteed. Complete installation data included. Unprecedented surplus sacrifice **$79.50, $89.50 and $114.50.**

ELECTRIC HAND SAW

(Item 36) Most perfectly balanced and smoothest running saw made. Advanced design provides max. power and light weight. Easily adjusted for all angles, depth and width of cut. Comes complete with 6¼" comb. blade, ripping guide and 10 ft. hvy. duty cord. Built-in saw-dust blower. Autom. telescoping guard. 110-120 v. AC-DC. Depth of cut 2¼". 1 year written guar. Wt. 12 lbs.
Drastically reduced.............. **$39.95**

GAUGE TESTER

(Item 27) Precision made of solid bronze and steel by Ashcroft. (Cat. #1300-5). Calibrated weights (incl.) acting against hydraulic piston provides quick accurate testing of all pressure gauges up to 500 psi. Brand new. Wt. 90 lbs. Reg. $318.00. Our Spec..... **$95.00**

8" TILTING ARBOR SAW

Terrific Value. Heavy duty ⅝" double ball-bearing arbor. Saw blade tilts, table remains level. Big 12"x16" precision ground table. (Extensions to 24"x16" avail.) Micrometer hand wheel controls tilt and depth—2½" cut. Cross-cutting, ripping, dadoing, sanding, bevel and angle cutting, all easily performed. Essential for all cabinet work. Motor carriage, mitre-gauge, rip-fence, splitter, guard and blade incl. Compares with saws selling at $89.50. DeLuxe Ball-Bearing model (Item 60) wt. 34 lbs.......................... **$44.95**
Bronze-bearing model (Item 70) ½" arbor, table 10"x13", wt. 34 lbs.... **$27.50**

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• **A-C Generators.** 115-V, 800-C, 1 KW.....$19.96
• **D-C 6-Volt Wind Driven Generator** outfit, complete.....$33.95

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Paint, blow up tires, clean gas lines with compressed air. Build your own portable hi-pressure unit.
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WINCHES, CLUTCHES—ENGINES—BLOCKS

• **Hell Power Winches.** Heavy duty 15,000 lb. with clutch and 150' ½" cable. Cost $275.....$169.70
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• **Double Sheave Blocks.** All steel for rope, 8". Pr. .....$ 7.76
• **Snatch Block.** 6" steel. 3000 lb.....$5.49

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• **Automatic Pressure Water System.** Leading make. For farms, cabins, etc. 110-volt 60-cy. 300 g.p.h. 22' lift $69.50
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This amazing plastic glue replaces old type glues. Ready for immediate use, allows ample assembly time. Use SPEEDI-GLU on woods, linoleum, fabrics, paper, ceramics, leather, porous pottery, felt, fibre, etc. Excellent for gluing Formica type plastics to wood.

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1 MOTO-TOOL KIT No. 2—Dremel's Model 2 Moto-Tool is the *fastest, most powerful tool in its class*—delivers approximately 27,000 R.P.M. It grinds, carves, routs, drills, engraves, sharpens, etc.—works well in wood, plastics, metal. Saves plenty on home maintenance jobs. Performs hundreds of shop operations, and for hobbies it's a *must*. Precision made, shockproof. 110-120 V. A.C.-D.C. Motor, Moto-Tool No. 2 only, $16.50. Complete Kit with 23 high quality, shop-tested accessories (*High-Speed Steel* Cutters, Grinding Wheels, Polishers, etc.), *Only*..... **$23.50**

2 MOTO-TOOL KIT No. 1—Contains lighter capacity No. 1 Moto-Tool with 34 accessories (steel cutters, grinding wheels, etc.) in attractive, lacquer-finish wood case. *Biggest bargain in the field!* Tool alone with 1 emery wheel point is only $9.85. Complete kit, *Only*..... **$17.50**

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4 MODEL 2000, SANDER-POLISHER—Fastest seller in the field. *Straight-line reciprocating action* guarantees *scratch-free finishes*. A fast-cutting production sander (14,400 sanding strokes per min.) for heavy-duty craft and wood-working projects, refinishing and redecorating. Gives you necessary power—*easy one-hand operation*—and 21 sq. in. of sanding surface for furniture making, boat building or refinishing, resurfacing large areas, building operations such as dry-wall joints, woodwork, siding and exteriors. Does a superb polishing job! Weighs 5 lbs.; needs no oiling; permits 10-second paper change; dustproof. Over-all size 3⅛" x 4½" x 7". 110-120 V., 60 cycle A.C. With *steel carrying case*, 25 asst'd. abrasive sheets, sheepskin pad, *Only*..... **$24.50**

5 MODEL "A" SANDER-POLISHER-MASSAGER—A lighter-capacity machine with same construction features as larger model—including *straight-line action for scratch-free finishes* and 14,400 strokes per min. By far, the most popular sander ever offered home owners, house-wives, hobbyists for all their sanding, polishing, refinishing tasks. Also a soothing massager! Wt. 2½ lbs.; sanding pad 2¾" x 3½". Complete with asst'd. sand-papers, a felt and sheepskin polishing pad, *Only*.... **$14.85**

6 ELECTRIC COPING SAW—Safe as a handsaw—cuts scrolls like magic—sands as it saws! For home, hobby, repair work—no other tool pleases so much for so little cost. Works in any direction—smoothly delivers 7200 strokes per min. Saws through ⅝" medium-hard wood at foot-a-minute speed. Trigger-touch foolproof action. Only 2 moving parts, never needs oiling. 110-120 V., A.C. *Free plans* packed with each saw for *6 useful wood projects*, and for *making your own table-type jig saw!* With 3 saw blades, *Only*..... **$5.85**

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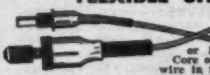

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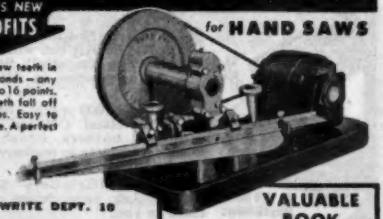

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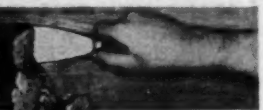

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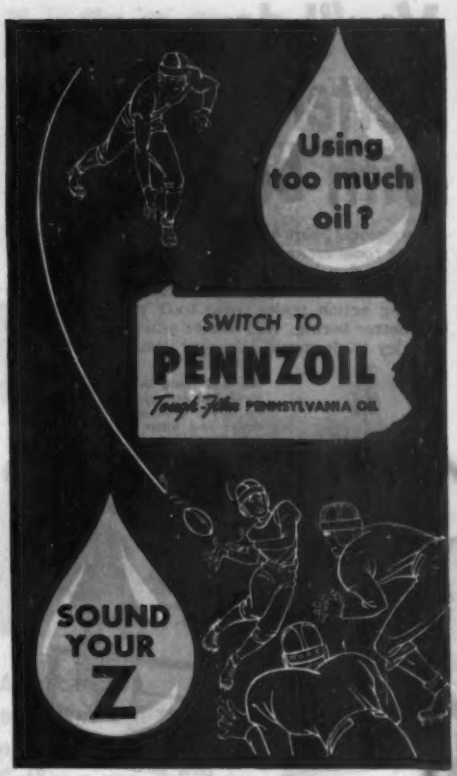

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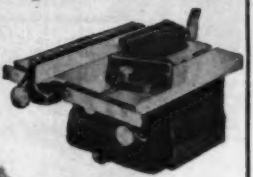

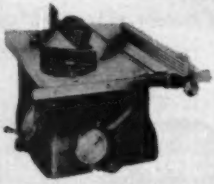

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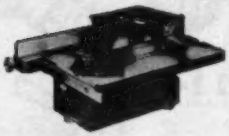

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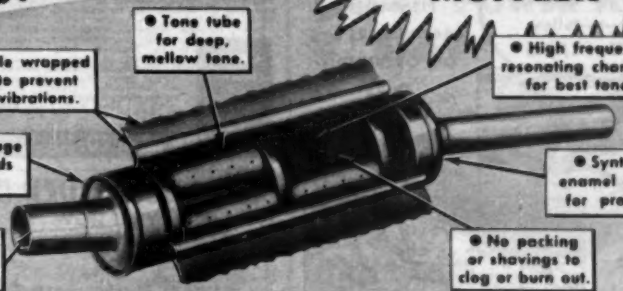

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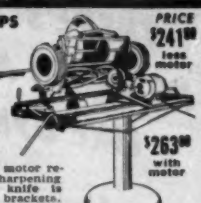

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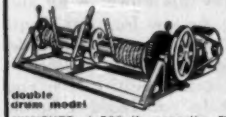

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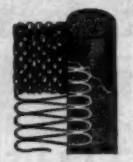

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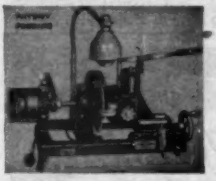

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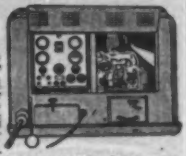

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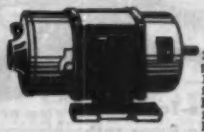

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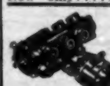
Pri. 95-125 Volt—Sec. Output 115 V—2000 V.A. Wt. 250 lbs. Gov't cost $900.00. Close out price f.o.b. KC. **$94.50**

BRAND NEW KIDDE HY-PRESSURE CYLINDER

Valve and safety locking pin. Applicable as tire inflator, fire extinguisher, spray painting, life raft, etc. Shatterproof. Size 12" x 2⅝". Wt. 3 lbs. Now only............ **$2.95** (plus 35c postage)

Eclipse De-Icer Distributor Valve



Brand new including built in 24 volt D.C. motor. Opens outlet ports in pair in continuous sequence. Standard pipe ports. Type 572 Model 3. Gov't cost over $250.00... **$27.50**

AIR FILTERS

Aircraft type. Removes dirt, dust, etc. For industry, home & laboratories. For forced warm air, conditioning units, etc. Made of heavy metallic mesh with metal frame. Permanent, needs no refills. Size 41"x6⅝"x2". Special price for quantity users. Wt. approx. 8 lbs. $25.00 value. **$3.50** ea.

Brand New Wonderful ROTATOR MOTOR

For rotating Ham, TV, FM Antennas, Turntables, Telescopes, etc. Applicable for 110 V. A.C. 60 cycles or for 24 V. D.C. as reversible motor. Approx. 7 R.P.M. Free Swing, Reversible Light Weight. Rugged, quiet, Motor & Gears oil sealed. Simple instructions & diagram incl. Wt. approx. 4½ lbs. **Stock No. 572.** $50.00 Value Now Only **$7.50** Post-paid

WEAVERS HYDRAULIC HAND PUMP

BRAND NEW. For hydraulic Jacks, presses, hoist, etc. For operating hydraulic cylinders, to pump oil or hydraulic fluid under pressure, including built in **check & relief valve,** and is capable of delivering 1000 lbs. pressure. Wt. 10½ lbs. A $60.00 value. Instructions incl. Price **$12.50** Post-paid

Pesco Vacuum Air—General Purpose Pump

Here is a pump for air, fluid, pressure or vacuum. Standard ½" pipe thread. Delivers 300 G.P.H. at 2000 R.P.M. Runs forward or reverse. Self aligning shaft. Spline terminal for direct drive, readily replaced with a pulley. Use them for oil burners, MILKING MACHINES, COMPRESSORS, VACUUM PUMP, etc. Engineering report and instructions incl. Now only......... **$9.95** Postage Paid

Pesco Centrifugal Heavy Duty Electric Pump

With built in ¼ H.P. MOTOR included. BRAND NEW. COMPLETE. Self Contained. Explosion proof. Ideal for pumping Gasoline, Oils, water and non-corrosive liquids. Applicable for 24 V. D.C./A.C. or on 110 Volts A.C. The Discharge is for ¾" hose connection. Capacity 400 G.P.H. Use them for Cottages, Basements, Laboratories, Boats, etc. Here's your Greatest PUMP VALUE IN YEARS. Engineering data and instructions incl. $85.00 value. **Stock #659.** Only........... **$12.95** F.O.B. K.C.

PUROLATOR HYDRAULIC FILTER

Filters your Hydraulic fluid, gasoline, or distillate without cartridge replacement. Protect your pump, engine, truck, tractor and motor boat with this unit. Just turn handle and element is clean. Standard ⅜" inlet and outlet ports. AVOID THAT STOPPED UP LINE. $13.00 value only............ **$4.95** Post-paid

Stratopower Constant Displacement HEAVY DUTY PUMP

For operating Hydraulic cylinders, hydraulic motors on tractors, Bulldozers, Construction machinery. Lift trucks. For fuel or oil transfer. Industrial applications, etc. Delivers up to 400 G.P.H. at 3750 R.P.M. Rated 1250 to 1400 P.S.I. 3750 to 4500 R.P.M. HAS BUILT IN RELIEF AT HEAD. Rotation either direction without adjustment. Can be used as hydraulic motor. $85.00 value. Engineering data & instructions incl. **Stock #37.** Wt. 8 lbs... **$17.50**

AIR OR OIL HYDRAULIC CYLINDERS

Stock No. 512 Double action hydraulic cylinder 2⅛" Bore, 4" Stroke, Dia. ¾" **including built in Hydraulic control valve** which may be operated with rod or lever. Clevis mounting. Overall length shaft retracted 14". $75.00 value. Wt. 6 lbs.... **$14.95** f.o.b. KC. Mo.

Stock No. 11. Double Action 1½" bore 6" stroke. Shaft, Clevis mounting base and shaft end. Capacity 1160 lbs. with 1000 P.S.I. input. Has a capacity of 1625 lbs. with our STRATOPOWER 1400 P.S.I. A $50.00 value. Postpaid Only.................. **$8.95**

Stock # 303—Double Action 2" bore, 11¾" stroke. Dia. 1½". Overall length shaft retracted 23". 2000 lbs. capacity with 1000 PSI gives 2800 lbs. with our stratopower. Wt. 14 lbs. **$17.50** f.o.b. KC. Mo.

Stock No. 12 Hydraulic Cylinder Double Action output 12560 lbs. with 1000 P.S.I. input. Gives 17584 lbs. with our STRATOPOWER PUMP 1400 P.S.I. or will produce 34168 lbs. with 3000 line pressure. Can also be operated on low pressure system. **4" Bore, 10¾" Stroke,** 1-5/16" shaft, clevis mounting O. Govt. Cost $300.00........... **$23.50** f.o.b. KC. Mo.

Pesco Hydraulic Flow Equalizer & Pressure Balancer Valve

Brand New. Guarantees equal flow and equal pressure for Two cylinders or Two systems. Capacity 300 G.P.H. 1500 P.S.I. Data & instructions incl. A $75.00 value. **Stock 1-D-397** **$14.50** Post-paid

HYDRAULIC CONTROL VALVE

Adel Precision #B-10329. For controlling 2 single action or 1 double action cylinder. Including built in toggle lever. When lever is in one direction it puts pressure on one cylinder connection and opens exhaust, from opposite cylinder. When lever is released it returns to the neutral position and lock cylinder. Brand new. A tremendous bargain........ **$8.95** post-paid

Hydraulic Solenoid Control Valve

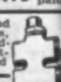
BENDIX, No. 81500 24V. D.C. For remote control operation and to operate one single action or double action hydraulic cylinders with 24 V. D.C. Recommended pressure 800 to 1500 P.S.I. connections are .550"—18thd. Diagrams & Data incl. $35.00 value. **$3.50** ea. **$6.50** per pair

PARKERS 3 WAY ROTARY VALVE

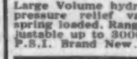
Brand New. With off position and is manual operated. All connections are ¾" Female I. P. This valve is ideal for 3 branch line and for low pressure fuel, water, air, or liquids. **Stock No. 23**..... **$4.95** post-paid

ALTERNATING SHUT-OFF VALVE

Brand New. High pressure. Operates by worm-gear cam operating poppets to alternately close & open either pair of four ports. Standard ⅜" pipe ports. $35.00 value only..... **$4.95** post-paid



Large Volume hydraulic control and pressure relief valve, ¾" ports, spring loaded. Range 1250 P.S.I. adjustable up to 3000 P.S.I. Brand New.... **$5.50** post-paid



VICKERS CONSTANT DISPLACEMENT HYDRAULIC PUMPS. Brand New Stock No. **PF-713-20.** For any type liquid pumping job. 375 gal. per hr. at 3750 R.P.M. 1000 P.S.I. .410 cu. in. per rev. Gov. cost $100.00......... **$17.50** post-paid

Send Check or Money Order. All Prices F.O.B.—K.C. M.O. Except When Marked Postpaid. U.S.A. Only—½ Deposit With C.O.D.

GENERAL SALVAGE CO., 2922 E. 27 St., Dept. 277 Kansas City, Mo.

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• TOO MUCH OIL...

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Piston Seal

AN ENGLISH IMPORT

• 10,000 miles of motor oil economy in every tube. Restores compression, stops piston slap, improves engine performance, and pays for itself many times over in reduced oil consumption. Endorsed by automotive experts everywhere—improves all internal combustion engines. Anyone can install—just remove spark plugs, insert rubber tube and squeeze. Send for complete details—FREE!

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RUSH DETAILS ON PISTON SEAL—*FREE!*

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Tighten Loose Handles

TO STAY

Use the "repairman's standby" — Smooth-On No. 1 Iron Cement — to anchor loose tool and cutlery handles, knobs, pulls, casters, clothes-hooks, bolts, screws, etc. You apply it like putty — no heat required. It hardens like metal. And because Smooth-On expands slightly as it sets, your repairs *stay tight*. Buy Smooth-On No. 1 in 1¾-oz., 7-oz., 1 lb. and larger sizes at your hardware store. If they haven't it, write us.

FREE Repair Ideas

40 pages of time-saving, money-saving ways to stop leaks, seal cracks, tighten loose parts. 170 illustrations. Clear, simple directions. Send now.

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THE IRON REPAIR CEMENT OF MANY USES

PAY-OUT HOLD-ON REEL

SURPLUS WINCH

ONLY 32.50

Originally used by the Navy to control gunnery targets when being towed by an airplane. Ideal for many uses. This winch will pay out, hold or reel in cable or rope. It has a capacity for 4500 feet of 3/32" cable or 2500 feet of 1/8" cable. The rotating drum is gear driven and is operated by a crank handle. Drum may be rotated at 1 to 1 or 8 to 3 ratio. A brake holds drum with with ratchet & pawl to set. Size 29"x 13½"x 13"

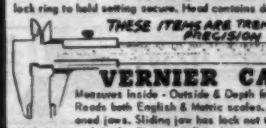
PRECISION GERMAN

MICROMETER

One of the finest quality, imported, precision tools on the market. Reads from .001. It has a ratchet stop for absolute accuracy and a lock ring to hold setting secure. Head contains decimal chart.

9.75 NEW

THESE ITEMS ARE TREMENDOUS PRECISION VALUES...



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VERNIER CALIPER

Measures Inside - Outside & Depth from .001 to 6 in. Reads both English & Metric scales. Specially hardened jaws. Sliding jaw has lock nut to hold setting. Made by one of the leading specialists in precision instruments.

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6 IN. SOLID STEEL STARRET SQUARE

Has specially hardened beams and edges, accurately ground to insure parallelism and straightness. Made of finest quality materials and highly regarded for its use as a standard square. A PALLEY VALUE for ONLY..

13.50 VALUE 8.72

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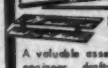
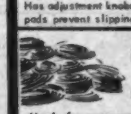
Originally used in engineering dept. of one of the leading aircraft plants. Has 24" arms. Head swings 360 degrees. Clamp-on mounting. In excellent cond. Without scales.

Only 59.00



PLASTIC PARALLEL STRAIGHT EDGE

A valuable asset to the navigator, engineer, draftsman or mechanic. Has adjustment knobs. Rubber pads prevent slipping. ONLY 97¢



A-N - JC-48
HARNESS WIRE
20, 16, 12 GUAGE

Handy for emergency repairs on radios, aircraft, autos, boats, etc. Sold only in bundles of 6 pounds or more. These bundles are in mixed gauges & lengths, very clean & unravelled. This wire normally sells for 4¢ to 5¢ per foot. Here is your opportunity to have a stock of wire in assorted gauges (approx. ½¢ per ft.) 6 lbs. for ONLY 2.95

CONTINENTAL
GAS ENGINE

THAT FAMOUS SINGLE CYLINDER, 4 CYCLE, ENGINE with a GENUINE RED SEAL, Air Cooled 'L' Head. Comes complete with all accessories such as; mesh type air cleaner, flywheel, magneto, float type carburetor, fuel tank, starter pulley, muffler, blower housing, etc. An ideal power plant for small farm machinery, lighting plants, air compressors, power tools, small boats, etc. Weighs only 43 lbs.

49.50

HI-SPEED TAPS
DEFENSE PLANT SURPLUS
Slightly used but perfect.

1/4-20	26¢	7/16-14	39¢
5/16-18	29¢	1/2-13	47¢
1/19-16	35¢	5/8-18	66¢
PIPE TAPS			
1/8	48¢	1/2	$1.32
1/8	69¢	3/4	$1.83

Attention Shop Owners, Defense Plants, etc. We carry $1,500,000 stock of machine tools such as Taps, Dies, Cutters, Reamers, etc.
SEND FOR CATALOG TODAY

WESTINGHOUSE
AIR COMPRESSOR

1000's now in use for spraying, inflating, air tools, in garages, laboratories, shops & on trucks, tractors, jeeps, etc. Lightweight but powerful. Operates on ½ HP, gas or electric motor. Runs either direction. Delivers approx 3.27 CFM at 600 RPM or 6.54 RPM at 1200 Rpm. Has 2" bore, 1½" stroke.

We have motors, tanks and fittings to adapt this unit. 23.95

TINY MITE
WINCH HOIST

This mighty little giant lifts up to 1000 lbs with its 30 to 1 Bronze gear drive. Cable drum is 4" x 1¼". Ratchet handle, safety & release pin. Ideal for Boats, Farm, Factory, Shop. ONLY 12.95

SEE OPPOSITE PAGE FOR TERMS

PALLEY SUPPLY CO.

6321 San Fernando Road · Dept. PS-10, Glendale 1 California

SAVE UP TO 85% IN WAR SURPLUS AT "GADGETEERS HEAVEN"

HYDRAULIC CYLINDER SPECIAL Gives 20,000 lb. thrust (push pull) using 1500 PSI line pressure as obtained from our hyd. pumps. Or will produce 40,000 lb. thrust with 3,000 lb. line pressure. CAN ALSO BE OPERATED ON LOW PRESSURE AIR SYSTEMS. 4" Bore, 1½" dia. piston shaft, 18" stroke, length 30½". Equipped with ball bearing loaded clevis type mounting and swivel type high pressure steel pipe bracket for easy use. Ideal for road, farm & shop machinery, presses, etc. Cost Gov't $390.00 **29.95**

We carry the World's Largest Supply of Special Hydraulic Equipment featuring over 20,000 Cylinders in 61 Sizes and Types. Can also supply all accessories such as Pumps, Valves, Tanks, Hose and Fittings. Write for information.

No. 3 HYDRAULIC CYLINDER Double action. Bore is 1". Shaft ½". Has a stroke of 2½" to 4". Stroke can be adjusted with internal sleeve stops. Overall length is 8½". Will take 1500 lbs. continuous duty. 3000 lbs. intermittent. Will lift or push to 1100 lbs. **5.75**

No. 9-E HYDRAULIC CYLINDER Double action cylinder. Has a bore of 1-3/8" and shaft of 1". Stroke is 9". Overall length 15¼". Built for 1500 lbs. continuous duty. 3000 lbs. intermittent. Will lift or push up to 2300 lbs... Can be adapted to hundreds of uses **9.75**

FOUR WAY VALVE
V-9A — LARGE VOLUME PRESSURE RELIEF VALVE ½" Standard pipe ports. Pressure setting — approx. 1200 PSI. Range 1000 to 2100 PSI....... **5.75**

V-17 — Poppet type, pressure balanced. Has piston with built-in relief valve to limit cylinder strokes. Inlet and outlet ports have ½" std. pipe ports. ½" A.C. tube to cyl. (⅝" x 18 thread) **9.75**

STRATO POWER PUMP With built-in variable flow control valve in head. Positive displacement piston type, displaces .450 cu. in. per revolution, 2 gal. per. min. cap. at 1500 RPM at 1250 PSI. Pressure limit, 1250 PSI continuous, 1400 PSI for 15 sec. Operates at 3750 RPM, intermittent maximum 4500 RPM. Rotates either direction without adjustment **19.50**

GEROTER TYPE PUMP Logan Geroter type. For operating hydraulic systems on trucks, tractors, etc. Delivers 8 GPM at 1200 RPM at 1000 PSI with 5 H.P. Can also be used as Hydraulic fluid motor. 3/8" std. pipe ports, 1/2" splined shaft for pulley or direct attachment. 5½" dia., 7" long. Used but condition guaranteed. **19.50**

TWO HEAT SOLDERING IRON
This is really TWO IRONS in ONE!! A control button in handle selects 150 or 300 watt heat. Full size iron for light & hvy work. Removable, solid copper tip. Complete with cord & tip. **4.95**

200 Pg. CATALOG — SAVE 85% — WAR SURPLUS
1000's of MONEY SAVING Bargains for the Mechanic, Housewife, Manufacturer, Hobbyist, etc. Clothing, Tools, Machinery, Metals, Electrical Supplies, Motors, Rubber, Plastics, Hydraulic supplies (cylinders, pumps, motors, valves, fittings, hose, etc). Send 25¢ to cover mailing & handling.

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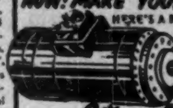
NOW! MAKE YOUR OWN ARC WELDER!



HERE'S A REAL BUY! Finest, Precision built, R-1 Generators, originally used on B-29 Airplanes. These generators cost the Government approximately $400.00 each. Gives from 300 to 400 amps at 27 volts. Ideal for all welding, light & hvy up to 5/8" thickness. Free instructions for converting to welding unit. **27.95**

Other AIRCRAFT GENERATORS

P-1	27 Volts	200 Amps	15.95	E-5A	12 to 15 Volts	50 Amps	12.95
1273-1A	27 Volts	75 Amps	15.95	03	27 Volts	100 Amps	25.00

VICKERS HYDRAULIC Transmission VT-1
Self contained, 2 H.P., constant torque at all speeds with variable volume reversible, piston pump (controlled by outside lever) supplying piston hydraulic motor. Automatic pressure, dash pot for smooth control. Power output RPM —0 to 1/3 input RPM in both directions. Input RPM 1800 continuous. 4000 intermittent. Dash pot can be removed for greater RPM. Ideal for lathes, duplicator set-up on mills, conveyors, small cars, drives, gearings, etc. **32.50**

4" SPLINE SHAFTS for input & power take-off .... **2.50 PR.**

ELECTRIC MOTORS

LEAR ELECTRIC MOTOR. 24 volt, 6 amps, series wound reversible motor with over-load clutch. Motor turns 11,000 R.P.M. Has 11 to 1 gear reduction box turning 1000 R.P.M. at take-off. Adaptable to flex or rigid drive. Limit switch box. Size 10" x 4". **$7.95**

SAMSELL MOTOR 27 volts, 16 amps 1/5 H.P. reversible, series wound on motor. 3800 R.P.M., shaft 9/32" diameter. 12-spline. 4-1/8" x 2-3/8". ONLY **3.95**

SURPLUS MOTORS
No. 300 — New ½ H.P. — 27 Volt, D.C.-A.C. This motor can be readily adapted to deliver up to ½ H.P. on 110 Volts, A.C. by the simple method of rearranging armature brush-leads. Free diagram with each order. A sensational value .. **5.95**

No. 300-A — Converted to 110 Volts-A.C. Equipped with plug and 3½ ft. Heavy duty cord ... **8.49**

D.C. METERS
AMMETERS
- 30-0-30+
- 60-0-60+
- 120-0-120+
0-120 : 0-240
0-300
Any above ammeters.. **3.95**

VOLT METERS 0-30 **4.95**

COMBINATION VOLT AMMETERS
30 V. — 30 AMP.
30 V. — 60 AMP.
Only **4.95**

ABOVE AMMETERS HAVE 2" FACE EXCEPT 0-300 WHICH HAS 3" FACE
IT IS NECESSARY TO USE SHUNTS WITH ALL D.C. AMMETERS
30-A 60-A 120-A
150-A 240-A 300-A **1.25**

PIANO HINGE

Overall	Width	Length	Price ea.
1¼"	(5/8" side)	72" alum.	$1.00
3½"	(1¾")	54" st. steel	$1.49

BRASS HINGE - 1¼" (5/8" side. .040 thick) Any length at ...per ft. .29

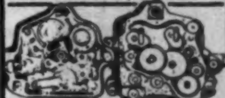
ATTENTION GADGETEERS

Electric GYRO Turns up to 50,000 R.P.M. Electric drive motor is integral part of balance wheel. Has double end shafts to drive precision tools or machinery at precise, controlled speeds. Full ball bearing mounted. Operates high or low voltage. A highly precise instrument, ideal for experimental work, science labs, hobbyists, & technical engineers. A tremendous buy **4.95**

Electric ACTUATOR Hundreds of uses for any mechanical device needing controlled 2-way action. Opens, closes, raises or lowers doors, windows, gates, valves.

CTU-2 Foote linear actuator. 24 Volt, A.C. or D.C., 8500 R.P.M., 1/6 H.P. — Series wound motor. 4½" stroke in 13½ seconds. Compression and tension loads up to 750 lbs. Adjustable micro-switch for limits of travel. Overall length retracted 11" **6.95**

GEAR HEAD MOTORS Heavy Duty G.E. Gear Head Motor. 1½ H.P., 24 volt DC, 125 amp reversible motor will drive reduction gear box unit 44.5 to 1, resulting in 168 R.P.M. at 5/8" diameter take-off shaft. Motor contains electro magnetic break.
UNIT COMPLETE **10.95** MOTOR **4.95**
GEAR BOX ALONE **7.95**



Electronic Transmisson Gear Train
GT-1 — approx. 50 Bronze Spur & Pinion Gears, 3/8" to 4" dia., 5 sets of 7 cluster gears, 2 complete worm and worm gear drive sets, 40 N.D. ball bearings ¼" to 1½" dia., watch springs, bushings, posts, face plates, housings, micro switches 2 miniature controlled clutches, etc. .. Gears in multiple size and sequence identical teeth ratio, giving 100's of gear reduction combinations. Wt. 19 lbs. **8.49**

VALUABLE GEAR BARGAIN Ideal for moving radio antenna, television antenna, etc. Only **6.75**

GEAR BOX — VTG-1 — 90° — bevel gear 1½ to 1 reduction. A lifetime value ..... Size: 7" x 6" ... **3.95**
Has lever control for engaging & disengaging positive clutch. Dust proof housing, prelubricated bearings ... Can be adapted to Vickers Transmission.

PALLEY FAMOUS MIXES

GADGET MIX — Rivets, Spacers, Bolts, Screws, Gears, Wheel bearings, Springs and Clamps. No. 106, 5 lbs. **1.19**

BEARING MIX. No. 170A. Approx. 20 needle, Ball & Roller Bearings, New & Used. Sizes: 1/2" to 4". Some of these cost Gov't $10 a piece. Never such a value! 5 lbs. ONLY **1.59**

HINGE MIX, No. 170H. 12 pairs of Strap and butt hinges, Hasps, 1" x 1" to 7/8" x 10" in length and 8" strap. 2 lbs. **1.09**

ABRASIVE AND GRINDING WHEEL MIX — 50 pieces including hone stone, pencil rolls, wheels, etc. A sharp value. No.170AG **99¢**

SPRING MIX, No. 206 — Torsion, Compression & Tension Springs. Asstd. sizes. A treasure trove for emergencies. Scores of springs. 5 lbs. for ONLY..... **1.69**

RIVET MIX — 3 POUNDS — Consisting of sizes from 1/4" to 3" long in many diameters & alloys. **1.19**

FILE MIX — Ten assorted Files — 4" to 12". Includes Vixens, half rounds, mills, bastards, etc. — in seconds and used but good condition. 1 Vixen alone is worth our price for entire mix... **99¢**

PULLEY MIX — You'll want this one around. 10 micarta & metal pulleys ranging from 1" to 5" with ball and one piece bearings. These are aircraft pulleys, the best made — with hundreds of uses. A WONDERFUL BUY! **2.95**

SCREW MIX — 5 lbs., including assortment of wood and machine screws. Many sizes. Save dollars and alway have plenty of screws on hand.. **1.39**

NUT MIX NM-1 — 3 lbs. approx. 500 nut. Anchor, Lock, Castle, Hex, Elastic Stop Nuts, etc. You'll always have plenty of Nuts in the shop. NM-1 **1.39**

SUPER COMBO MIX — No. SC2. Here's a real bargain. All the above mixes for ONLY **12.95**

AIRCRAFT CABLE

Rust resistant, alloyed steel. Extra flexible. Pre-formed, 7 x 19 strand. On reels.

1/16"	4½¢ ft.	3/16"	9½¢ ft.
5/64"	5¢ ft.	7/32"	10½¢ ft.
3/32"	5½¢ ft.	1/4"	12½¢ ft.
1/8"	7¢ ft.	9/32"	15¢ ft.
5/32"	7½¢ ft.	5/16"	16½¢ ft.
1/2"	20¢ ft.	3/8"	18¢ ft.

Special! 3/16" cable, 18 ft. long with turnbuckle ends .... .99¢

Stainless Steel Cable — Pre-formed

1/16"	6¢ ft.	5/32"	20¢ ft.
3/32"	14¢ ft.	1/4"	26¢ ft.

Bronze Cable — Not Pre-formed

1/16"	5¢ ft.	3/16"	23¢ ft.
1/4"	17¢ ft.	1/2"	30¢ ft.

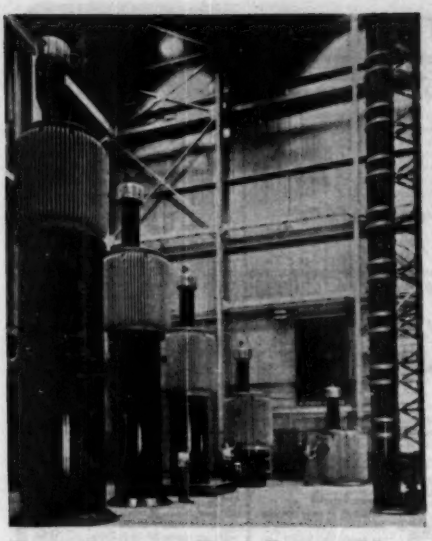
Plow Steel Cable Hemp Center 6 x 19
7/8" .... 25¢ ft. 1" .... 28¢ ft.

FIRE EXTINGUISHER
Kiddie Lux — CO_2 Type. Built to Gov't specifications. Heavy, shatter-proof case. Recent hydro-static test. Reconditioned and fully charged.
READY FOR INSTANT USE!!

2 lb. size with Swing Nozzle ...	13.75
3½ lb. size with Swing Nozzle ...	17.95
7½ lb. size with Horn	23.75
10 lb. size with 3½ ft. flexible hose and Horn..	29.75
15 lb. size with Wheel Control ..	34.95

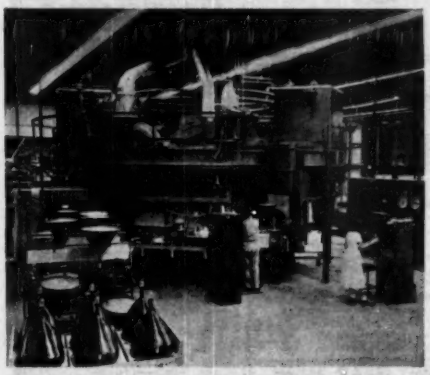
15" MONKEY WRENCH
Adjustable Jaw — Opens to 4". Drop Forged... Auto Type. Black **97¢**

LARGEST FIRM OF ITS TYPE IN THE WORLD



Transformers Test Power Lines

THE five giant transformers above are in for a big shock. Placed on successively higher insulating towers at GE's High Voltage Laboratory, Pittsfield, Mass., the units will be purposely short-circuited at 1,590,000 volts to study the effects of lightning on power lines. Such research helps develop more efficient means of transmitting electric power.



Big TV Tubes Get Big Machine

THIS giant automatic machine exhausts the air from two dozen 24-inch television viewing tubes at the same time. Thirty feet in diameter and costing more than $200,000, it is said to be the largest equipment of its kind. Sylvania Electric Products, Inc., is the builder.

All About Russian Cars

[*Continued from page 111*]

The same writer goes on with an example:

". . . A worker tries to remove three screws from a cover with gasket; as he has not brought the suitable monkey wrench, he might fix it with a hammer and screwdriver. He breaks one screw and as he can find no proper screw to fit the hole again, he simply forces another one into the thread . . . what does it matter if the thread of this valuable machine goes to the devil; the gasket will hold—at least until the next repair."

USSR Has Vast Resources and Man Power

But the standards of success in the Soviet are not the same as in other countries. As the former prisoner of war, quoted above, wrote: "The managers' state of Russia dominates its labor in a way that is quite impossible for us to grasp. The state extends its rule to every phase of living of the workers to such a degree that it has complete control over the liability side of the profit and loss account. Therefore, working at a loss in our sense of the word is practically nonexistent."

Despite all the talk about the inefficiencies of the Russian auto industry, we should be mindful of other warnings. Russia now controls the valuable auto industries of East Germany and Czechoslovakia. And we must remember that tremendous resources in raw materials and raw man power can be poured into a project on a scale that makes up for the waste and inefficiency. Russian tanks and aircraft, for example, have shown themselves to be of good quality and are produced in large quantities. It may even be that some of the deficiencies of the auto industry are due to concentration on more warlike vehicles. END

Eye Changes Shape to Focus

THE human eye, unlike the lens of a camera, changes its focus by actually changing its shape. Contraction of an eye muscle flattens the lens for viewing faraway objects. The camera lens accomplishes the same effect by moving closer to the film.

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- ☐ Attachments and Accessories for South Bend and other lathes
- ☐ 14½" South Bend Lathes
- ☐ 16" South Bend Lathes
- ☐ Series 900 & 1000 South Bend Turret Lathes
- ☐ No. 2H South Bend Turret Lathes
- ☐ 7" South Bend Shaper
- ☐ Information on Rental-Free Motion Picture Films

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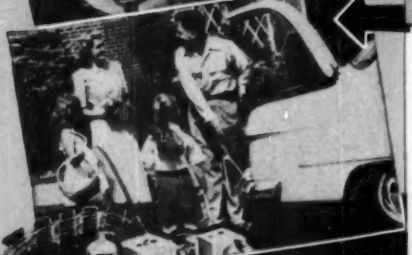
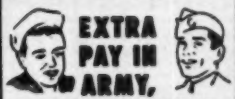


Servicing



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Act Now! Send for my FREE DOUBLE OFFER. Card entitles you to actual lesson on Servicing; shows how you learn Radio-Television at home. You'll also receive my 64-page book, "How to Be a Success in Radio-Television." You'll read what my graduates are doing, earning; see photos of equipment you practice with at home. Mail card today. No postage needed. J. E. SMITH, President, Dept IKB, National Radio Institute, Washington 9, D. C. Our 38th year.

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